

Rock Products

DEVOTED TO
Concrete and Manufactured
Building Materials

Volume XIII.

CHICAGO, ILL., JULY 22, 1913.

Number 1.

CAROLINA PORTLAND CEMENT COMPANY

We are the largest distributors of Portland Cement, Lime Plaster, Fire-brick and General Building Material in the Southern States, and have stocks of Standard Brands at all of the Atlantic and Gulf Seaports, and at our interior mills and warehouses, for prompt and economical distribution to all Southern territory. Write for our delivered prices anywhere. Also Southern agents for the "Dehydratine's" waterproofing material. "Universal," "Acme" and "Electroid" Brands Ready Roofing. Get our prices.

Charleston, S. C. Birmingham, Ala. Atlanta, Ga. New Orleans, La.

DEXTER Portland Cement
THE NEW STANDARD

Sole Agents **SAMUEL H. FRENCH & CO.** PHILADELPHIA

**UNION MINING COMPANY**

Manufacturers of the Celebrated

MOUNT SAVAGE
FIRE BRICK
GOVERNMENT STANDARD

DEVOTE a special department to the manufacture of Brick particularly adapted both physically and chemically to

**Lime Kiln and
Cement Kiln
Construction**

Large stock carried. Prompt shipments made. Write for quotations on Standard and Special shapes, to

UNION MINING CO.
Mount Savage, Md.

CAPACITY 60,000 PER DAY
ESTABLISHED 1841



THE HOTEL UTAH
SALT LAKE CITY

Salt Lake City's new two million dollar hotel

"American Keene Cement" used.

Durability Strength Superiority
USE



"STRONGEST KEENE CEMENT KNOWN"

AMERICAN KEENE CEMENT CO., SIGURD, UTAH



CHICAGO BELTING COMPANY
PURE OAK TANNED LEATHER BELTING

RELIANCE and SEA LION WATERPROOF

CHICAGO BELTING CO., 113-125 N. Green Street, CHICAGO

Branches: New York, New Orleans, Portland, Ore., Los Angeles, Cal., Cleveland, Ohio.

The two brands of leather belting that represent the best in belt construction. Our catalog is yours for the asking.

Tannery, Niles, Mich.

**SPECIAL FEATURES IN THIS NUMBER**

Value of Motor Truck in Builders Supply
Business.....Page 23
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Phoenix Portland Cement UNEXCELLED FOR ALL USES.
Manufactured by
PHOENIX PORTLAND CEMENT CO.
NAZARETH, PA.

Sole Selling Agent, WILLIAM G. HARTRANFT CEMENT CO.
Real Estate Trust Building, PHILADELPHIA, PENNSYLVANIA.

Ottawa Silica Co.'s Washed White Flint Sand

Is used for sawing stone in more than a dozen states. Cuts more and lasts longer than any other sand on the market. Unexcelled for Roofing, Facing Cement Blocks, White Plaster, etc. Freight rates and prices on application.

OTTAWA SILICA CO.

Ottawa, Ill.

Best Bros. Keene's Cement

"The Plaster That Stands Hard Knocks"

A cement noted for its quality and durability for over twenty-five years. Ideal for all high-grade interior finishing and decorative work. The one plaster that can be guaranteed for finish work on concrete.

Write for "The Inner Wall"



The Best Bros. Keene's Cement Co.

Estab. 1889

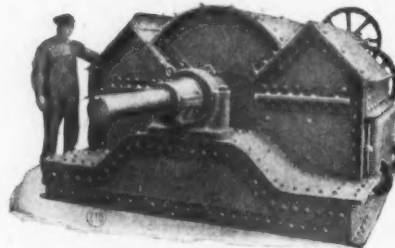
NEW YORK

Dept. A, Medicine Lodge, Kan.

(40)

CHICAGO

"PENNSYLVANIA" HAMMER CRUSHERS



For Pulverizing Limestone, Lime, Cement Rock, Marl, Shale, Etc.

Main Frame of steel. "Ball and Socket" Self-aligning Bearings; forged Steel Shaft; Steel Wear Liners; Cage adjustable by hand wheel while Crusher is running. No other hammer Crusher has such a big Safety Factor.

PENNSYLVANIA CRUSHER CO.

Philadelphia

New York

Pittsburgh



MILLS

Montreal

Hull

Bellefleur

Lakefield

Calgary

Port Colborne

Shallow Lake

Marlbank

Winnipeg

Exshaw

For Prices Any Where in
CANADA
Write or Wire Our Nearest Sales Office

Canada
Cement Company
LIMITED

Montreal - Toronto
Winnipeg - Calgary



ONE GRADE—ONE BRAND

Alpha Portland Cement

Best in the World for
Sidewalks

Write for our Handsomely Illustrated Book. Sent Free.

General Offices: No. 7 Center Square, EASTON, PA.

SALES OFFICES:

The Ouvee Bldg., PITTSBURGH.

Builders Exchange, BALTIMORE.

Harrison Building, PHILADELPHIA.

National Bank Bldg., SAVANNAH, GA.

Builders Exchange, BUFFALO.

Board of Trade Bldg., BOSTON.

Hudson Terminal Bldg., N. Y.

Marquette Bldg., CHICAGO

Northwestern Portland Cement



The Reliable Portland
Cement

A Portland Cement
for the

NORTHWEST

NORTHWESTERN STATES PORTLAND CEMENT COMPANY
MASON CITY, IOWA



The Best Cement Rightly Used Means Permanency



Of course the cement itself must
be up to standard.

In strength Lehigh exceeds the
standard by 35%. Permanency is in
every sack, insuring lasting work,
satisfied customers and so repeat
orders for dealers.

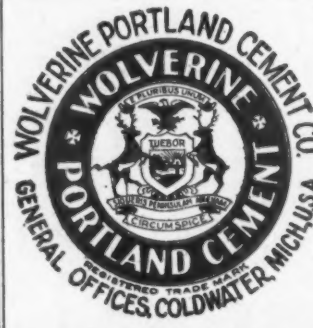
Lehigh Portland Cement Co.



CAPACITY
12,000,000 BARRELS



Allentown, Pa. Chicago, Ill.



"WOLVERINE"

The Alright Cement

MADE RIGHT SOLD RIGHT
WORKS RIGHT
WEARS RIGHT

The Best is None Too Good For You.
Insist Upon.

"WOLVERINE"

Write for Booklet and Quotations.
Factories at Coldwater and Quincy, Mich.
Capacity 3500 Daily.

WOLVERINE PORTLAND CEMENT COMPANY

W. E. COBEAN, Sales Agent,
Coldwater, Michigan

Main Office, Coldwater, Mich.

GRABATT

30-11-15

ELI FRANK, ATTORNEY, 1319-1322 FIDELITY BUILDING
BALTIMORE, MARYLAND

Trustees' Sale

Valuable land situate upon the Chesapeake and Ohio Canal in Washington County, Maryland, about four miles above Harpers Ferry, West Virginia, and of the improvements, machinery, tools and supplies thereon.

By virtue and in pursuance of an order of the District Court of the United States for the District of Maryland, in Bankruptcy, passed in the matter of the Potomac Refining Company, a Bankrupt, the undersigned Trustees will sell at public auction upon the premises, on Saturday, the 16th day of August, 1913, at one o'clock P. M., all that valuable tract of land, with the improvements, machinery, tools and supplies thereon, as follows:

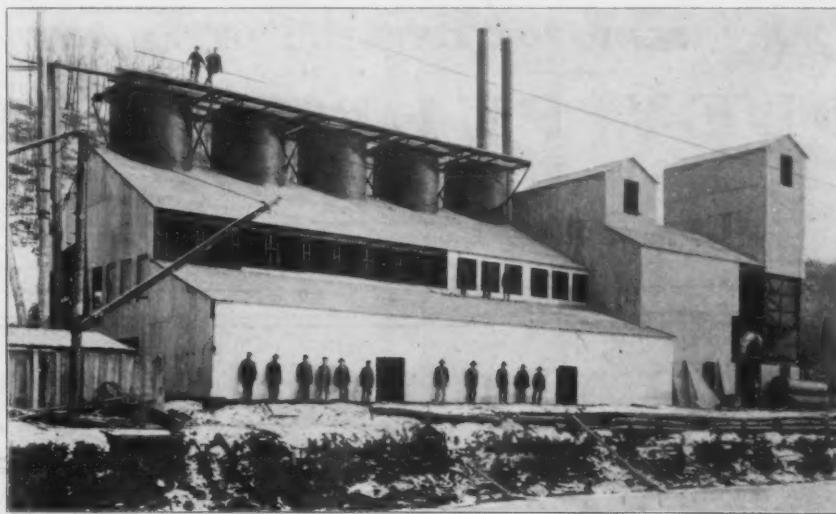
All that tract of land lying in Washington County in the State of Maryland, about four miles above Harpers Ferry, West Virginia, fronting about three thousand two hundred and eighty-eight feet upon the Chesapeake and Ohio Canal and containing one hundred and ninety-seven acres, more or less, and more particularly described in two deeds to the Potomac Refining Company, as follows:

One from John J. Byrne to said Company, dated November 25th, 1910, and recorded among the Land Records of Washington County, in Liber E. O. No. 134, Folio 634, and the other from Christopher Byrne to the said Company, dated January 30, 1911, and recorded among the said Land Records in Liber No. 135, Folio 223 etc.

The said property has just been examined for the Trustees by R. C. Williams, Ph. D., Mining Geologist, of Baltimore City, and analyses of the lime stone and dolomite thereon have been made by Messrs. Penniman and Browne of Baltimore City, analytical and consulting chemists. These reports are on file with the Trustees and may be examined by prospective purchasers.

Plant

Dr. Williams says, "There are five steel clad continuous kilns of the Allen type, a Kritzer hydrater of the latest pattern, a Corliss engine which will supply, at eighty pounds pressure, one hundred and forty horse power, two Ames boilers of one hundred horse power each and well arranged and designed shafting and conveyors. The building is constructed of steel and concrete. Viewing it as a whole, in my judgment, it is one of the best, if not the best, designed and constructed plants for the economical production of hydrated lime with which I am acquainted."



PLANT

Dolomite The dolomite deposit on this property is extensive and would make a very fine quality of very white lime. Mortar made with it has a greater ultimate strength than mortar from a high calcium lime. This deposit can be reached by a short extension of quarry tracks. The cover is light and the stone can be very economically quarried. Doctor Williams is of the opinion that it will average less than one per cent of silica. This dolomite is of the kind suitable to be used in the manufacture of iron and steel.

The plant, equipment and supplies comprise the following:
Five patented Lime Kilns, 12 feet diameter, 45 feet high, all ready for operation, in first class condition.
Complete Kritzer Hydrater and Crusher.
One Corliss Engine, 150 H. P., in first-class condition.
Two 100 H. P. High Pressure Steam Boilers, Ames make, self protection.
One 20 H. P. 240 Volts Allis-Chalmers Dynamo, set up able to light the entire plant.
One Main Kiln building, 2 stories, 50x80 feet.
One Boiler and Engine Room, 1 story, 60x40 feet.
One Hydrating Room, 3 stories, 50x33 feet.
One Cooling Floor, 1 story, 80x26 feet.
One Tool House, 15x10 feet.
The above are all under one roof, the building being of steel structure joined with 20 gauge galvanized iron.

Terms of Sale The property will be offered as a whole and in lots. The terms of sale will be cash, in the case of all sales of personal property alone, and cash upon the ratification of the sale in case of real property, and should the whole of said property be sold in bulk, the terms of sale will be cash upon the ratification thereof by the court; a deposit of \$500 will be required of the purchaser of the real estate or of the whole of said property in bulk.

MORRIS A. SOPER, 628 Equitable Building, Baltimore, Md.
J. CRAIG McLANAHAN, Maryland Casualty Tower, Baltimore, Md.
CHAS. E. COCKEY, 808 Union Trust Building, Baltimore, Md.

Trustees

JACOB E. FISHER, Auctioneer
Hagerstown, Md.

Lime Stone Deposits

There are two kinds of lime stone on the property, "high calcium" and "dolomite." The quarry which has been worked by the Potomac Refining Company is open in a high calcium deposit. The analyses show this lime stone to be of rather poor quality. There is another quarry on the property facing the canal and within easy reach of the kiln building, in which the lime stone is of a better quality and which lime stone will give

as a finished product a second grade agriculture and building lime. This, in the opinion of experts, will be a marketable proposition, owing to the low cost of freight by canal boat to Washington, the plentiful supply of experienced labor, cheap supply of coal, and the fact that the quarry has a sixty foot face that is self-draining. The cover is very light for some distance from the river, thus avoiding the serious expense of stripping for a number of years.

Blacksmith's tools.
One hand derrick.
One lot of iron pipe.
Eight tons fire clay.
One scow.
One motor-boat.
One water-heater, Harrison make, in good condition.
Two large half ton coal buckets.
Two patent pot kilns.
One Manganese washer.
One blacksmith shop.
One bungalow (furnished) 50x50 feet with a 100 ft. porch, eight rooms and bath, steam heat, porch 9 feet wide.
Five room frame dwelling and small stable.

The GIANT GRIFFIN MILL

PULVERIZES

Cement Rock—Coal—Slate—Cement Clinker

Foundry Facings or any other refractory material where an exceptionally fine grind is necessary—especially efficient on cement materials—large unit—economical in maintenance and consumption of horse power.

The Bradley Three Roll Mill

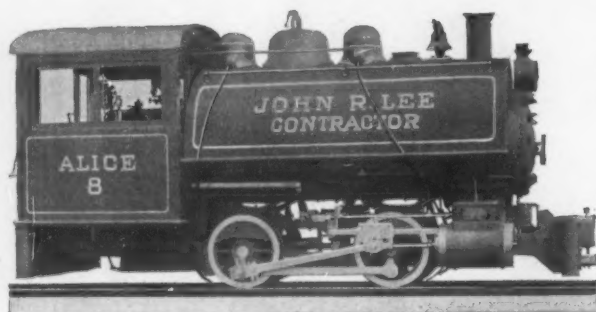
PULVERIZES

Phosphate Rock—Limestone for agricultural purposes—Flint Clay for Fire Brick manufacture and other materials which do not require a finer grind than 75% thru a 100 mesh screen—especially efficient for pulverizing limestone for agricultural purposes—simply constructed—easily operated—low in h. p.—low maintenance cost—large output.

SEND FOR CATALOG No. 42

BRADLEY PULVERIZER CO.
BOSTON LONDON BERLIN

INDUSTRIAL LOCOMOTIVES



The designs of our small locomotives are the result of wide experience, extending over a period of 78 years. We began building locomotives in 1835.

The material used in these locomotives is thoroughly tested and is the best of its kind.

All details are accurately finished to standard gauges, and are absolutely interchangeable on all locomotives of the same class and size.

This cuts out long delays when parts wear out, as parts liable to wear can be kept on hand, or shipped promptly from our works.

AMERICAN LOCOMOTIVE COMPANY

30 CHURCH STREET, NEW YORK

McCormick Building, Chicago

Carl G. Borchert, Pioneer Building, St. Paul, Minn.

N. B. Livermore & Company, San Francisco and Los Angeles, California

Northwestern Equipment Company, Seattle, Washington, and Portland, Oregon

Dominion Express Building, Montreal, Canada

A. Baldwin & Co., New Orleans, La.

Tell 'em you saw it in ROCK PRODUCTS



Points of Interest Concerning The Ehrsam Wood Fibre Machine

The log feeds itself to the saw. As the log decreases in diameter the Speed of the log and of the feed **INCREASES AUTOMATICALLY**.

In other words, the Peripheral Speed remains constant.

The feed of the log to the saw is in direct proportion to the speed of the log. This automatic uniformity of feed **INSURES UNIFORMITY** of **FINE-NESS** in the **PRODUCT**.

No frictional devices are used, none being necessary.

All the working parts are planed. All of the gears are cut from solid steel.

All of the parts are interchangeable and numbered, so that duplicate parts can be quickly obtained and easily put in position.

The Saw mandril is extra heavy and made of the best crucible steel.

The journals are chain oiling. No Machine can be more substantially built. Write for full information.

J. B. Ehrsam & Sons, Enterprise, Kans.

Gentlemen:—Some time ago I received a letter from you asking how the wood fibre machine you shipped us is doing. Will say it is the best I ever used. In regard to any suggestions I could make as to how it might be improved, will say that I can make none, as it is O. K.

Yours truly,

SOUTHWEST CEMENT PLASTER CO.

Okeene, Okla., June 14, 1911

Frank Dodge, Sup't.

Manufacturers of Jaw and Rotary Crushers for Gypsum, Vibrating Screens,
Hair Pickers, Wood Fibre Machines, Calcining Kettles,
Plaster Mixers, Power Transmission

The Enterprise Vertical Burr Mill

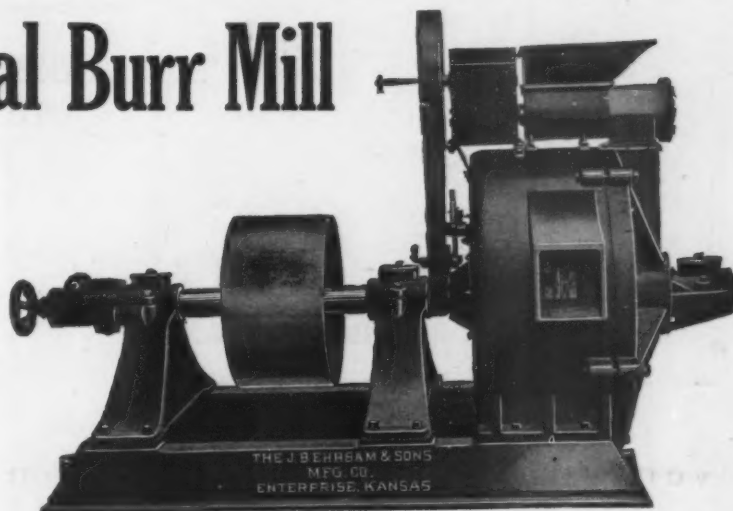
is especially designed for grinding gypsum, limestone, coal, coke, paint, rock, foundry facing, carbon, salt, and other similar substances.

It is **STRONG** and **DURABLY** built.

Has **INTERCHANGEABLE STONES**, which can be easily removed for dressing and replaced.

Is provided with our **POSITIVE CONTROLLABLE FEEDER**, which feeds an absolutely uniform stream into the mill at the required capacity.

**MANY OTHER
ADVANTAGES.**



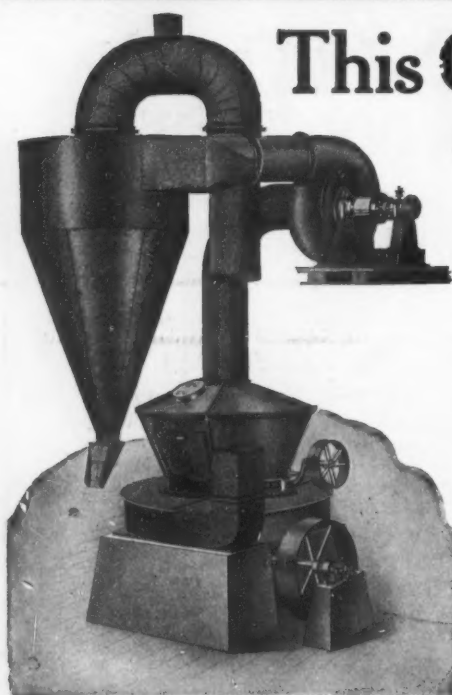
The J. B. Ehrsam & Sons Mfg. Co.

Designers and Builders of

Complete Equipment for Plaster Mills

ENTERPRISE, KANSAS, U. S. A.

Tell 'em you saw it in **ROCK PRODUCTS**



This Coal Grinder Saves 12% in Coal

A Most Remarkable Economy in Cement Manufacture

The Raymond Coal Pulverizer is particularly adapted for grinding coal in Cement plants. The economy mentioned above is possible because the Raymond Mill grinds the coal to much finer mesh than has heretofore been possible and the separation is done by vacuum air suction. The mesh is absolutely uniform; no tailings to be reground.

No coal is wasted and none escapes to the grinding room to choke the workmen. No bolters, reels or screens with their troublesome shutdowns and costly replacements are necessary for separation.

No elevators, conveyors or handling machinery are needed as the air separators perform this service at the minimum initial cost and lowest maintenance and power expense. In the

RAYMOND PULVERIZING SYSTEM

Limestone, can be ground at the rate of 6½ tons per hour 92% 200 mesh and coal enough for 3000 bbls. of clinker per day can be ground in 12 hours.

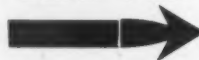
Manufacturers who have grinding problems in other industries will find that the Raymond Mill, while most efficient in producing a ground product of any required mesh, will at the same time work economies of so many varied kinds that they will prefer it to all others.

All installations guaranteed to do what we claim.

Send for our Book which explains in detail what our system is and how and where it may be used. Read this book and you may find the way to divert some items from the expense account to the dividend account.

We design special machinery and methods for Pulverizing, Grinding, Separating and Conveying all powdered products. We manufacture Automatic Pulverizers, Roller Mills, Vacuum Air Separators, Crushers, Special Exhaust Fans and Dust Collectors.

SEND FOR

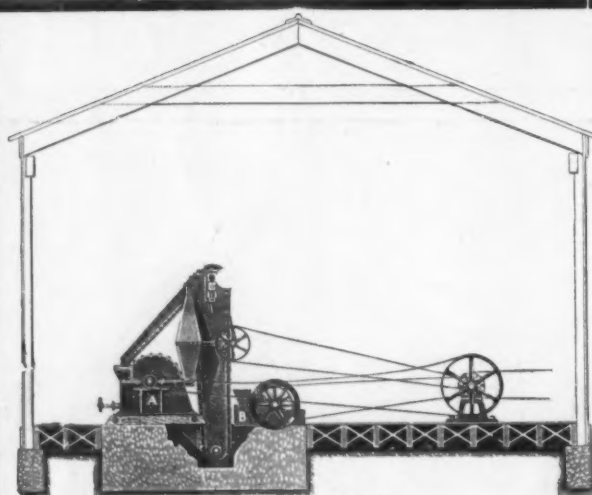


THE BOOK

Raymond Bros. Impact Pulverizer Co.,
1301 N. Branch St., Chicago.

Please send us your Book on Modern
Methods of Pulverization.

Name
Street
City State



Stationary Plant

Reclaim Your Waste Product

GRIND YOUR LIMESTONE SCREENINGS AND MAKE LIMESTONE FERTILIZER

What is Now a Dead Loss to Some Quarrymen
Can Be Turned Into Good Profits

WE FURNISH COMPLETE PLANTS OF ANY CAPACITY DESIRED

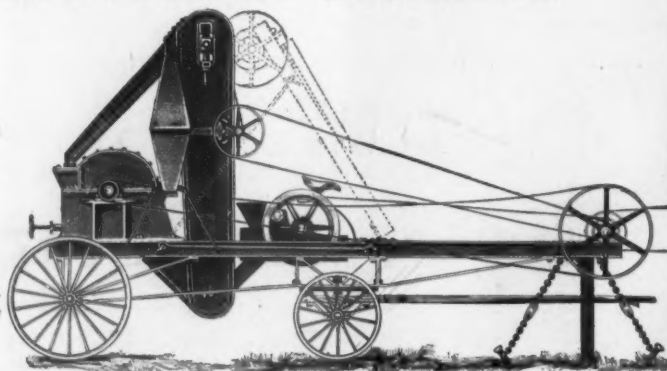
Manufactured and Licensed under 87 Separate and Distinct Patents

We now have over 50 plants in operation

BULLETIN NO. 4 EXPLAINS THE
PROPOSITION

**The Williams Pat. Crusher &
Pulv. Co.**

ST. LOUIS 2705 N. Broadway
CHICAGO: Old Colony Bldg.
SAN FRANCISCO: 428 Monadnock Bldg.



Portable Plant

Tell 'em you saw it in ROCK PRODUCTS



AUSTIN GYRATORY CRUSHERS

Made in Eight Sizes

50 to 5000 Tons Per Day

Plans and Specifications submitted and expert advice free on any problems involving rock-crushing or earth-handling.

AUSTIN MANUFACTURING CO.

CHICAGO

New York Office: 50 CHURCH STREET

Canadian Agents: MUSSENS, Ltd., Montreal

We manufacture:—Road and Elevating Graders, Scarifiers, Road Rollers, Quarry Cars, Dump Wagons, Stone Spreaders, Street Cleaning Machinery.

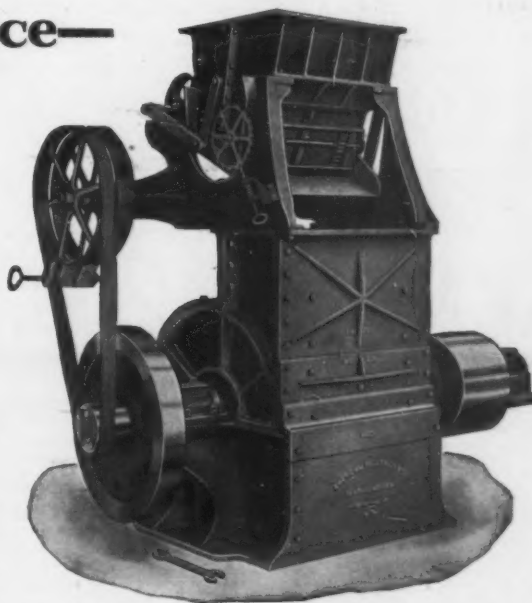


A Tremendous Crushing Force— NOT a Striking Force

is the reason for the remarkable
efficiency of

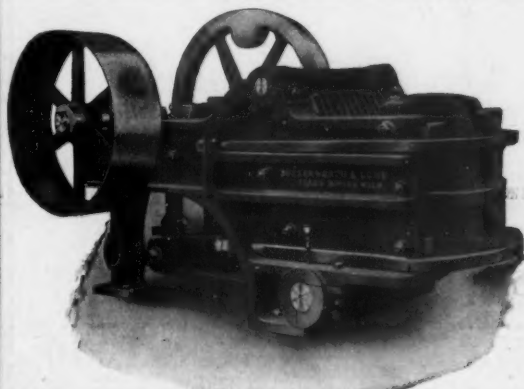
The American Ring Pulverizer

This is a principle which former inventors and builders of pulverizing machinery have overlooked. Instead of a hammer movement, at high speed, the rings of our Pulverizer roll upon the material as it lies upon the concave grinding plates or grate bars and create an impact cushion, forcing atom against atom and crushing or squeezing the material to be pulverized with tremendous pressure. The saving in power, due to the great reduction in speed, is also a prime factor in operation cost. The speed of the American Ring Pulverizer is less than half of that of any rotary hammer mill.



All of the crushing and grinding parts are made of the best manganese steel, making possible the crushing and pulverizing of the hardest material without the slightest injury to the machine. Built in six sizes. Write for complete details.

AMERICAN PULVERIZER COMPANY, East St. Louis, Ills.



Nippers—17 x 19", 18 x 26", 20 x 30", 24 x 36" and 26 x 42".

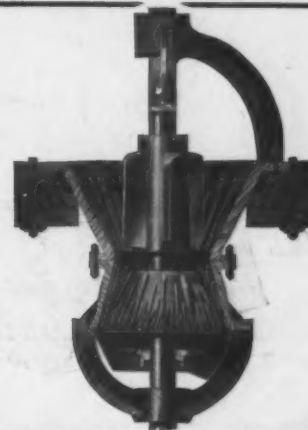
Jaw and Rotary CRUSHERS

For all Rocks and Ores Softer than Granite

GYPSUM MACHINERY—We design modern Plaster Mills and make all necessary Machinery, including Kettles, Nippers, Crackers, Buhrs, Screens, Elevators, Shafting, etc.

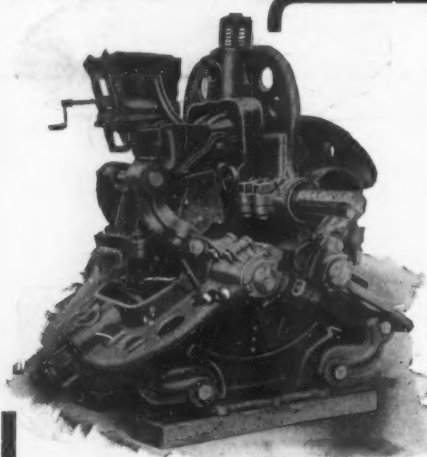
Special Crusher-Grinders for Lime

Butterworth & Lowe
17 Huron Street, Grand Rapids, Mich.



Crackers—6 sizes—many variations.

Tell 'em you saw it in ROCK PRODUCTS



MAXECON

Means MAXimum of ECONomy

Years of experience with the assistance of our hundreds of customers has found THE SOLUTION OF GRINDING HARD MATERIALS. The MAXECON PULVERIZER combines highest EFFICIENCY, greatest DURABILITY and assured RELIABILITY, Uses the LEAST HORSE POWER per capacity. Embodies the features of our Kent Mill with improvements that make it MAXECON.

WE DO NOT CLAIM ALL of the CREDIT for this achievement

We have enjoyed the valuable suggestions of the engineers of the Universal Portland Cement Co. (U. S. Steel Corp.), Sandusky P. C. Co., Chicago Portland C. Co., Marquette Cement Mfg. Co., Western P. C. Co., Cowham Engineering Co., Ironton P. C. Co., Alpena P. C. Co., Castalia P. C. Co., Pennsylvania P. C. Co., and many other patrons.

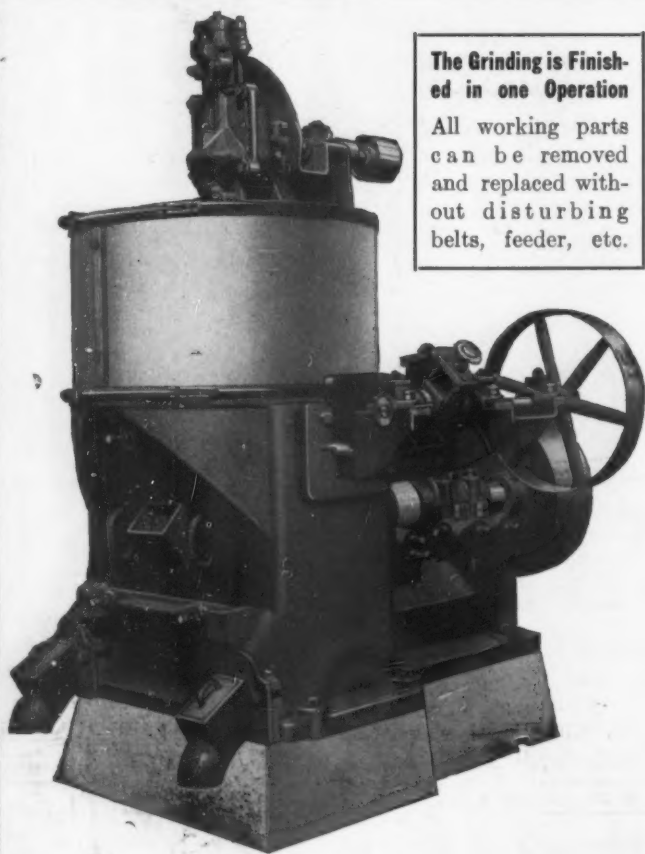
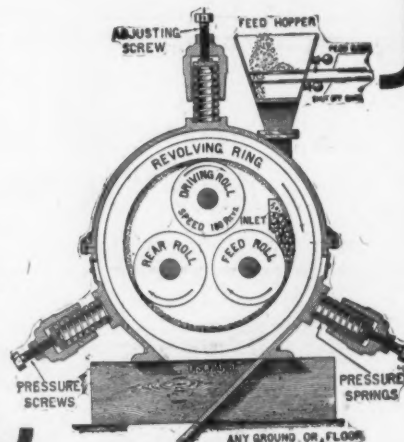
THE RING WOBBLER

The FREE WOBBLING POUNDING RING instantly and automatically ADAPTS its position to the variations of work.

Its GRINDING ACTION is DIFFERENT than any other; besides the STRAIGHT rolling action of the rolls, the SIDE TO SIDE motion of the ring makes the material subject to TWO crushing forces and DOUBLE OUTPUT results.

KENT MILL CO.

10 RAPELVEA ST., BOROUGH OF BROOKLYN, N. Y. CITY
LONDON, W. C., 31 HIGH HOLBORN
CHARLOTTENBURG 5, WINDSCHEID STRASSE 31, BERLIN



The Grinding is Finished in one Operation

All working parts can be removed and replaced without disturbing belts, feeder, etc.

BONNOT PULVERIZER

Grinds and Screens Limestone, Raw Lime and Hydrated Lime

Does it at One Operation. Gives You Any Desired Fineness

GRINDING LIME IS LARGELY A SCREENING PROPOSITION. THE BONNOT PULVERIZER HAS THE LARGEST SCREENING SURFACE AND CONSEQUENTLY THE GREATEST CAPACITY.

NO OTHER MACHINE LIKE IT IN THE ACCESSIBILITY OF SCREEN AND GRINDING PARTS.

[No. 4 Catalog Explains These Advantages

THE BONNOT COMPANY

909 N. Y. Life Bldg.
KANSAS CITY, MO.

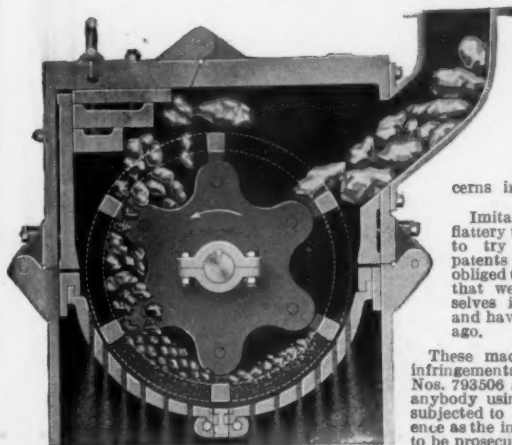
CANTON, OHIO

Tell 'em you saw it in ROCK PRODUCTS

THE GARDNER CRUSHER

For Grinding and Pulverizing Limestone, Feldspar, Oil Cakes, Bone Tankage, Marl, Phosphate Rock, Bricks, Granite, Coal, Etc.

WARNING



We warn our prospective customers against imitations of our machine which have lately been put on the market by two of the largest concerns in America.

Imitation is a great flattery to us but in order to try to infringe our patents they have been obliged to resort to devices that we have tried ourselves in the beginning and have abandoned long ago.

These machines are direct infringements of our patents Nos. 793506 and 1013527 and anybody using them may be subjected to future inconvenience as the infringers are going to be prosecuted.

GARDNER CRUSHER COMPANY 556 West 34th Street, NEW YORK

AGENTS

MARSH COMPANY, Old Colony Bldg., Chicago, Ill.

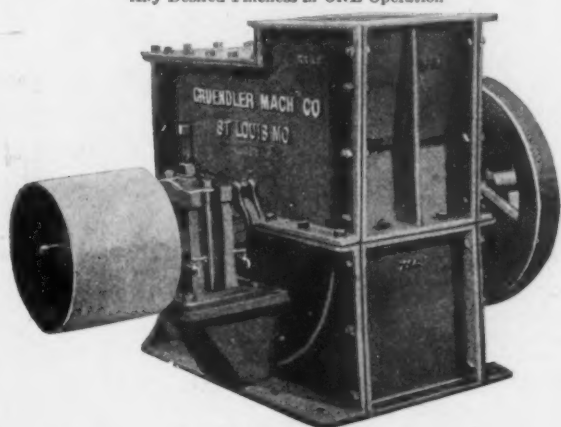
C. O. BARTLETT & SNOW CO., Cleveland, Ohio

W. E. AUSTIN MACHINERY COMPANY, 2 Spring Street, Atlanta, Ga.

GRUENDLER PULVERIZERS

Grind perfectly Limestone, Phosphate Rock, Coal, Brickbats, Coke, Kaolin, Shale, Marl, Fireclay, Bones, Tankage, Fertilizer Materials and Ores of all kinds.

Any Desired Fineness in ONE Operation



One Customer Writes:

"The Crusher works to our entire satisfaction and we believe we have selected the best make for our purpose."

Another One Says:

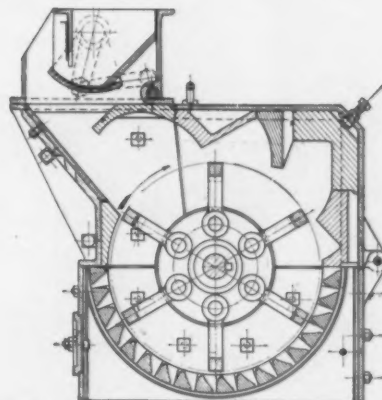
"The two Crushers you have furnished us have given entire satisfaction. We are now considering putting in another machine of larger capacity; kindly state lowest prices and sizes."

We manufacture these machines in sizes from 3 to 400 tons daily capacity. The entire interior is constructed of steel and they are built for great strength and durability throughout. They are easily handled, all adjustments being made from the outside.

Write for Catalog and Prices

GRUENDLER PATENT CRUSHER & PULVERIZER COMPANY
924-928 N. FIRST STREET SAINT LOUIS, MO.

Pulverators



Cross Section of Allis-Chalmers Pulverator (Patented)

Pulverizing

by a New Principle

Note that Involute Curve
The Direction of Rotation

Advise us your requirements concerning capacity and fineness wanted

Forward Sample of Your Material

Allis-Chalmers
Manufacturing Company

MILWAUKEE,

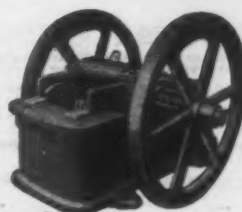
WISCONSIN.

For All Canadian Business Refer to Canadian Allis-Chalmers, Ltd., Toronto, Ont.

TISCO MANGANESE
STEEL CASTINGS

FOR SEVERE SERVICE

TAYLOR-WHARTON IRON & STEEL CO.
HIGH BRIDGE, NEW JERSEY

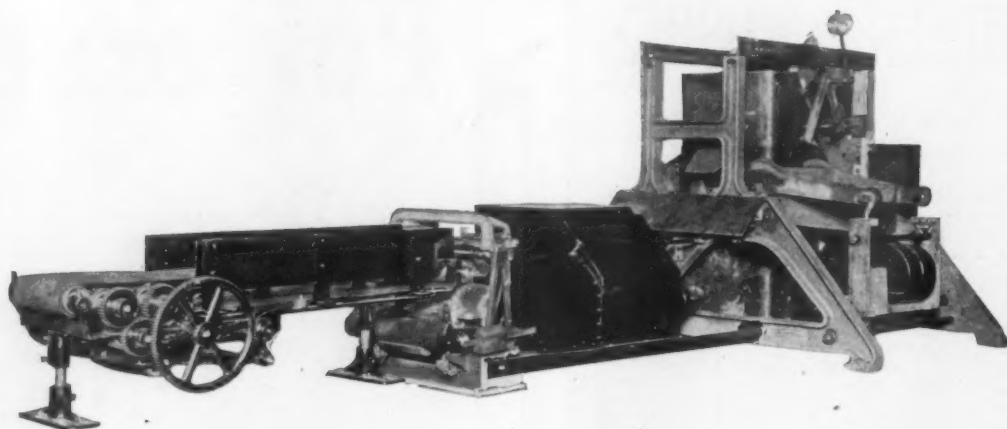


Lewistown Foundry & Machine Co.
LEWISTOWN, PA.

Builders of heavy duty crushers and glass sand machinery. Glass sand plants equipped complete.

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Cement of the highest quality is only made by the exact required proportions of

CLINKER AND GYPSUM

Your chemist, with this machine, will give the desired result

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134 to 140 Commerce Street, NEWARK, N. J., U. S. A.
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OUR MOTTO—"QUALITY and SERVICE"

(Prices Always Right)

WIRE, MAIL OR PHONE OR-
DERS TO NEAREST MILL

The National Retarder Co.

SUCCESSORS TO

The Chemical Stucco Retarder Co.
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The Ohio Retarder Co.
Port Clinton, Ohio

The Binns Stucco Retarder Co.
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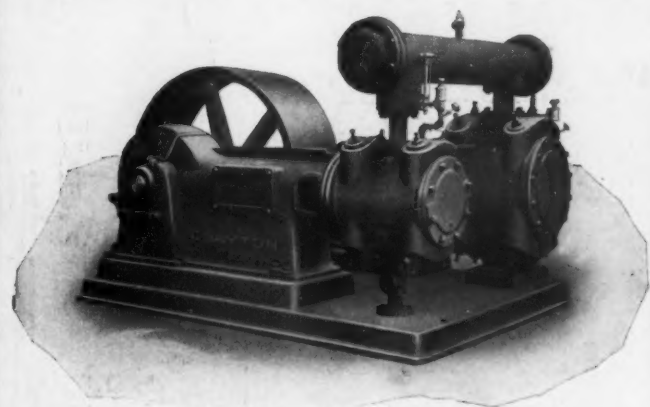
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THE CLAYTON TWO STAGE, SELF OILING COMPRESSOR



A High Class Machine at a Reasonable Price.
Built particularly for locations where air is charged with dust and grit.

Air Valves and all Running Parts fully enclosed.
Arranged for steam, belt or geared drive.

Two stage compressors for 80 lbs. and above, save power, are more uniformly stressed and give better satisfaction than one-stage machines.

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SPECIAL RATE FROM MAY 1st

Rooms with
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Rooms with
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ACCOMMODATIONS FOR 500 PERSONS

NEW YORK

American Steel & Wire Company

Triangle Mesh Concrete Reinforcement



Union Central Life Insurance Building, Cincinnati, Ohio
Mauran, Russell & Crowell, Architects

IN this modern building about 100,000 square feet of Triangle Mesh Concrete Reinforcement were used.

Triangle Mesh Concrete Reinforcement is made from Cold Drawn Steel Wire. Tensile strength 85,000 pounds per square inch. Furnished in rolls of 150, 200 and 300 feet.

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MITCHELL LIME

has been made for over fifty years. It has always maintained a standard of high quality and uniformity. It is today recognized as the leading high calcium lime.

For chemical or building purposes it will give the best of results.

Two plants with ample capacity and two railroads, guarantee prompt shipments and quick deliveries.

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Works:
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528 Peoples Gas Building,
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Watch The Architect, Mr. Dealer

When architects specify this material time after time for their most particular jobs—it will pay you to push its sale.

"TIGER BRAND" Hydrated Lime

It has been specified for white coat plastering in the most modern buildings in the country. Architects know that it will give satisfaction.

You can safely recommend TIGER BRAND and sell it for white coat work on any building—anywhere.

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650 Tons of
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White Rock
Finish used
for the finish-
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Lime &
Stone Co.
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Waste Means Loss of Money

WASTE means that you are reaching down into your pocket and meeting leaks that should not exist. For more than seven years we have been expounding the merits of

Monarch Hydrated Lime

As a result, thousands of contractors will use no other. They have learned by experience that it more closely approaches perfection than any other lime, because there is absolutely no waste.

They know that it requires no screening.

That it takes more sand; gauges with one-third less plaster and spreads farther and easier than lump lime.

These are features that are causing thousands to use Monarch Hydrated Lime. Are you one of this number?

BROOMELL Improved LIME KILN



The kiln shown in the illustration embodies several important improvements and is the very latest word in lime kiln design.

Supported on concrete piers.

Cone has heavy cast iron shoes at bottom.

Cone is supported by heavy I beams.

Cone is not bolted to the sole plate.

Cone can be taken out in an hour's time.

All plates above the furnaces are interchangeable.

Joints of plates are covered with butt straps.

Furnaces are built in the most substantial manner.

The kiln is very easy to erect.

The cost is low.

A. P. BROOMELL,
Manufacturer, York, Penna.

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The Ohio and Western Lime Company

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Ohio and Indiana White Finishing Lime, Ground
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Lime, Cement, Plaster, Hair, Etc., Etc.

Capacity
8000 Barrels
Per Day

MAIN OFFICE: Huntington, Ind.

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That Made Gibsonburg, Ohio, FAMOUS

MANUFACTURED BY THE

NATIONAL MORTAR & SUPPLY CO.
PITTSBURG PENNSYLVANIA

CROWN HYDRATE

HIGH CALCIUM HYDRATED LIME

At present prices you can waterproof, improve the color and strengthen the texture of all cement construction and actually **save money** because the Hydrate **replaces** the same amount of cement (15 to 25%).

Kritzer Vacuum Process

MARBLEHEAD LIME COMPANY

KANSAS CITY

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**"If It Is Lime
We Make It"**

Dealers, Attention!

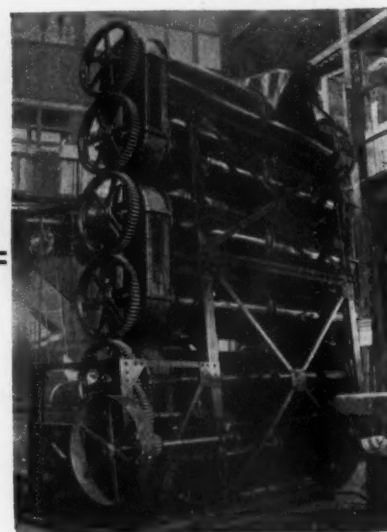
We manufacture the **Strongest Lime** in Ohio. The reason! Our Lime Stone is of that quality. We can ship straight or mixed cars of bulk, barrels, Mason Hydrate, Lime Flour White Finishing Hydrate, also Clover Grower for improving the soil. Write or wire for prices.

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HYDRATED LIME

Its Marvelous Increase In Consumption



KRITZER CONTINUOUS PROCESS

Are You Meeting the Increasing Demand for Hydrated Lime?

There is nothing forced or unnatural about the growing popularity of this product. It is a natural growth resulting from a widespread awakening to the advantages of Hydrated Lime for a variety of uses—as waterproofing for Concrete, in wall plaster, and in almost every case where lime is called for. In hydrated form it is weatherproof, more easily handled, and better adapted to modern methods, both of commerce and construction. A continued growth of the demand may therefore be expected.

The Kritzer Way

insures a product which will hold a continued place for itself on the market. We install plants complete, designed by our own expert engineers to meet your local conditions and turn out a uniform grade of Hydrated Lime of the highest standard, and with the greatest economy in cost of production. The Kritzer Continuous Hydrator, and the accessories installed with it, are the recognized standards in this line.

The Kritzer Service

Any lime can be successfully hydrated by our process; but whether your lime can be hydrated and successfully marketed is another question. We study your proposition and the possibilities of its commercial success, and advise you accordingly. Our nearly ten years' experience in the business is a valuable assistance in this. Ours is not a mail order proposition. We investigate our customers' proposed plant thoroughly before we will enter into a contract with them. We turn down more prospects than we advise to go into the business. We can't afford to have any failures. Our customers' success is our success.

WRITE TO US

THE KRITZER COMPANY

Chicago, Ill.

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WELLER-MADE

Weller means
Quality
Machinery

Weller Machinery Represents the Highest Quality and Construction Possible

The use of Weller Elevating and Conveying Machinery means *reducing* the cost of handling materials in quarries, mines and manufacturing plants. This is proved by the large number of Weller installations and the economy they have effected.

Weller Machinery and "Service" are closely linked. Each in itself represents the *best* and most *highly developed*, until they are fully deserving the *merit* mark of esteem accorded them by users everywhere.

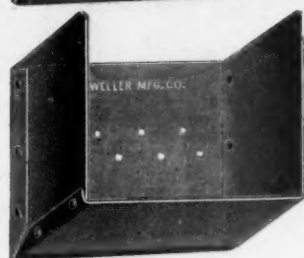
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Elevator Buckets



Collar Oiling Bearings

Don't Buy Hydrated Lime



Clyde Hydrator with Hood
"The common sense way"

at random; **specify "Clyde Process" Hydrated Lime.** The material that has the qualities **you** want, either as a consumer or a dealer. The presence of this **quality** has enabled Clyde operators to sell 90% of the Hydrated Lime used in America. Insist on getting "Clyde Process" Hydrated Lime, it will put snap into the appearance of your work, it will ginger up a sick selling organization. If your dealer or producer doesn't carry this material, send us his name, we will tell you where you can get it in your neighborhood. We furnish complete "Clyde Process" Hydrating plants with capacities from 1 ton an hour up. Interesting booklets for the asking.

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CRUSHERS

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SCREENS

Thirty Years of Practical Experience has taught us that no one machine is adapted to all purposes. Customers expect correctly designed machines for their special work. Our large line enables one to select properly. It consists of:

CRUSHERS—For coarse, medium and fine work on hard or soft rock. Jaw, Rotary and Hammer design.

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TRI-ROLL MILLS—For medium crushing, giving Two Roll Reductions.

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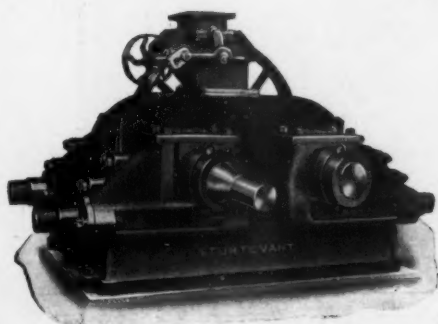
SCREENS—Inclined Vibrating and Rotary for fine or coarse work—wet or dry.

Sampling Crushers, Rolls, Grinders and Screens.

Send for Catalogue.

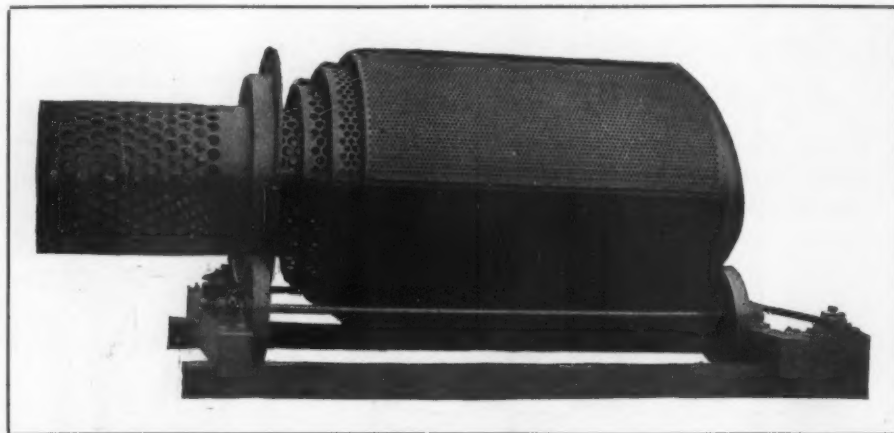
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NEW YORK CHICAGO CLEVELAND DENVER PITTSBURGH ATLANTA VICTORIA, B. C. LONDON ENG.



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made solely by Johnston & Chapman, is the

ONLY SCREEN

on the market for wide-awake quarry-men and miners, who want to separate crushed granite, limestone or other minerals, gravel, sand, coal or coke. It will soon earn its cost in saving of repairs, and maintenance, and reduced power, and will do more and cleaner work than any other cylindrical screen of like area. No one can afford to keep old traps in use when the O'Laughlin installed

NOW

will from the moment it starts give a better and larger product, and a big interest on your investment in continuous saving in cost of repairs, renewals, and power. For particulars address:

The advantages of these screens are described in detail in a circular which WE WILL MAIL TO ANY ADDRESS. Mr. John O'Laughlin, the inventor, has designed many notable improvements in rock-drilling, quarrying, crushing and screening machinery, and uses these improved screens in his own crushing plants, which others have declared "to be the most perfect in existence in every detail." The O'Laughlin Screen is an important factor in the most modern and perfect stone-crushing plant.

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Corner Francisco and Carroll Ave., Chicago, Ill.

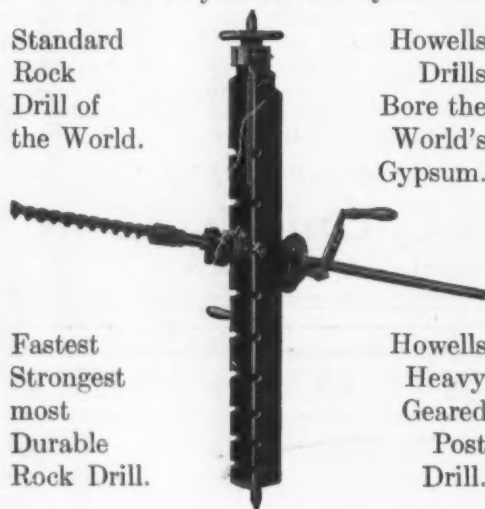
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for all purposes where drills are required. Combine efficiency and economy.

Standard
Rock
Drill of
the World.

Howells
Drills
Bore the
World's
Gypsum.



Fastest
Strongest
most
Durable
Rock Drill.

Howells
Heavy
Geared
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Drill.

Thousands of these drills doing duty everywhere — speak for themselves.

These drills have a record — can't be beat. Will drill from five to seven inches per minute in gypsum or soft rock.

We make over 40 different kinds of Auger Drills, operated by Hand, Electricity and Air.

Howells Mining Drill Company

Plymouth, Pa., U. S. A. ::

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IT PAYS DIVIDENDS

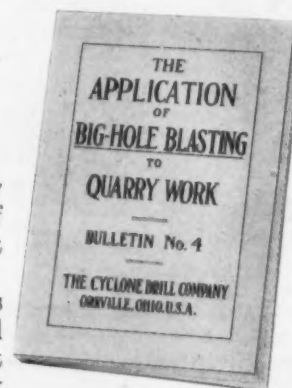
THIS BULLETIN

It explains just how the big-hole method of blasting reduces the cost of stone.

The analysis embraces not only drilling and shooting operations, but it deals with the quarry plant as a whole and shows how the big drill increases output and reduces cost in ALL departments.

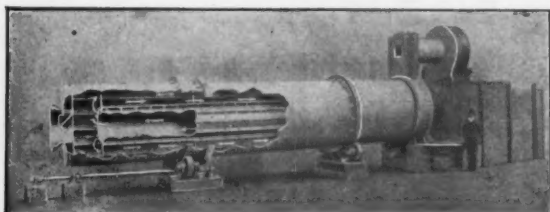
THE BULLETIN contains 68 pages, with illustrations showing 32 plants where CYCLONE DRILLS are earning from 100 to 500 per cent on the investment.

We will be glad to furnish Bulletin No. 4 to all who are interested in high-efficiency plant operation. Send for it.



THE CYCLONE DRILL CO., BOX 630, ORRVILLE, OHIO

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Section showing direction gases pass through the dryer.

Neither Guesswork Nor Theory

are practiced by us when it comes to solving a problem in drying. We know what we can do for we have been specialists in the drying field for the last 16 years.

RUGGLES-COLES "DOUBLE SHELL" DRYERS

are used in all parts of the world, there being more than 350 installations. Over half a hundred are used for drying sand and gypsum at plaster, brick and cement plants.

We build six regular types of dryers, but for special work we build machines to order.

Book "What We Dry" will interest you.

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CHICAGO OFFICE
McCormick Building

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50 Church Street
NEW YORK

BUFFALO WIRE WORKS CO.

BUFFALO, N. Y.

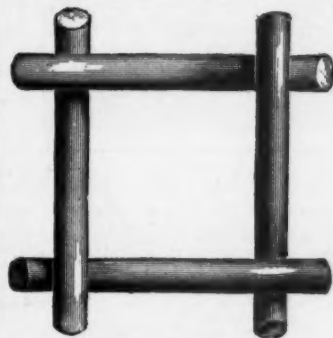
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Wire Cloth

From the coarsest to the finest, for all purposes,

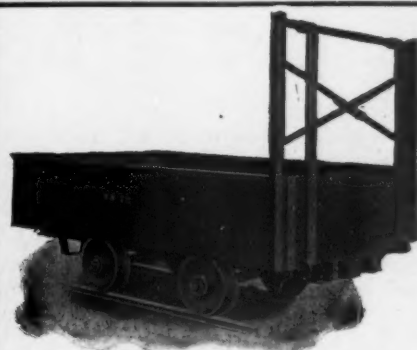
Also

WIRE CONCRETE REINFORCEMENT, WIRE WORK of all kinds, CORRUGATED WIRE "LATHING"



1-Inch Space, No. 4 Wire

Send for Our No. 416 Catalogue.



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The Quarry Cars That Give the Service You Want

Carefully designed and built to give the longest and most satisfactory service under the severest exactions of quarry usage. There is an Industrial Car for every purpose and each is the best of its kind to be had.

Illustrated Catalogue on Request. Write

The Electric Locomotive & Car Co.

West Park, Ohio



This is the man who saves the life of many a cement house. He makes the

Bay State Brick and Cement Coating

which prevents hair cracking from moisture, becomes a part of the material itself without destroying the distinctive texture of concrete or stucco, can be used equally well on brick or wood, and its dull, velvet tone gives a beautiful tint to interior woodwork in mills, garages and manufacturing plants. When applied overhead will never drop off and injure delicate machinery.

It was used here



Monroe Page & Shaw, Cambridge, Mass.
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Don't fail to write for book J. which tells about Bay State Brick and Cement Coating.

WADSWORTH, HOWLAND & CO., Inc.

Paint and Varnish Makers and Lead Corroders

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FOUR-TRACK REINFORCED CONCRETE BRIDGE, BEREA, OHIO.
NEW YORK CENTRAL LINES

MEDUSA GRAY PORTLAND CEMENT

CELEBRATED FOR ITS UNIFORM COLOR AND STRENGTH
GUARANTEED TO PASS AND SURPASS STANDARD SPECIFICATIONS

Over 100,000 barrels of Medusa Portland Cement
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Write for free illustrated booklets and samples of

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- MEDUSA WATERPROOFING
- MEDUSA WATERPROOFED CEMENT
(GRAY AND WHITE)

Sandusky Portland Cement Co.
SANDUSKY, OHIO



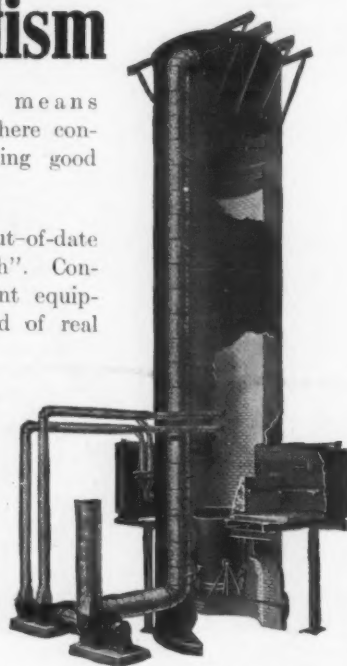
Conservation vs. Conservatism

Conservatism frequently means merely paying expenses—where conservation would mean earning good profits.

Conservatism clings to out-of-date equipment as "good enough". Conservation replaces inefficient equipment with that possessed of real earning power.

The installation of Doherty-Eldred Lime Kilns superseding obsolete kilns will prove to be a splendid example of profitable conservation.

*Explained in Bulletin
No. 4.*



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Combustion Engineers
EXECUTIVE AND SALES OFFICES
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DIRECT HEAT DRYERS

FOR

**BANK SAND
GLASS SAND
ROCK, CLAY
COAL, ETC.**

All Mineral, Animal and Vegetable Matter.

We have equipped the largest plants in existence and our dryers are operating in all parts of the world. Write for list of installations and catalogue S. C.

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**BACON & FARREL
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CRUSHING - WORLD KNOWN
ROLLS-CRUSHERS**

EARLE C. BACON, ENGINEER
HAYMEYER BUILDING, NEW YORK



WORRELL'S ROTARY DRIERS

(First Efficient Rotary Fire Driers Built)

**DIRECT OR INDIRECT HEAT,
FOR SAND, CLAY, CRUSHED ROCK, GRAIN
and other granular or fibrous matter. High Efficiency, Durability and Simplicity.**

IMPORTANT: In sending for prices and printed matter state your required hourly capacity, approximate % moisture in your product, etc., or mail pound sample in tin or glass.

S. E. WORRELL

Established 1879

209 Center St.

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Farnam "Cheshire" Lime Co.

OF CHESHIRE, MASS.

MANUFACTURERS OF THE

Celebrated Cheshire "Finishing" Lime

Well known throughout New York and the Eastern States as the finest finishing lime manufactured. The special feature of this lime is its quick and even slacking, thus preventing any cracking or checking when put on the wall. It is the best lime used in the country today for all

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ESTABLISHED IN LOUISVILLE, KY., 1902.

DEVOTED TO CONCRETE AND MANUFACTURED BUILDING MATERIALS.

Volume XIII.

CHICAGO, JULY 22, 1913.

Number, 1

THE FRANCIS PUBLISHING COMPANY

EDGAR H. DEFEBEAUGH, Prest.

Seventh Floor, Ellsworth Bldg., 537 South Dearborn St., Chicago, Ill., U. S. A.
Telephone Harrison 8086, 8087 and 8088.

EDITORS:

EDGAR H. DEFEBEAUGH,

FRED K. IRVINE.

Communications on subjects of interest to any branch of the industry are solicited and will be paid for if available.
Every reader is invited to make the office of Rock Products his headquarters while in Chicago. Editorial and advertising copy should reach this office at least five days preceding publication date.

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Summer conventions at the beaches begin to look good to the fellow who is hard at it all the time.

The building material dealers are too busy to talk about it just now. So far, 1913 has been a hummer.

That big transcontinental road project is just about as live as such a large undertaking can be. Slowly, but moving right on.

The dust nuisance of country roads is better overcome by concrete road surface than any other. Here is argument enough for a little more money for the price of the road.

Money derived from auto licenses is very properly being put into road improvement by practically all of the states. Beyond question, the auto increases the demand for good roads.

Those lime manufacturers who do not hydrate their product realize the need of trade expansion, while those who do hydrate all their product have more trouble in building new kilns than anything else.

Just the cost of hauling makes a great big item in road construction. It is more than the cost of materials and labor combined in some road contracts. This is a field for the auto-truck, which has not yet been tried out.

Michigan is to have a great state road traversing her southern peninsula north and south. Yes, it's to be a concrete road, forty feet wide. It begins to look as if Michigan means to be the great road-building example for her sisters.

The ever increasing line of building specialties which are most properly handled by the dealer of building materials has called into being the elaborate show rooms of the leading establishments. Some of them are veritably complete exhibitions. No doubt the idea has been developed by the cement shows and similar expositions.

In the laying of drains and disposal systems, it is always well to look beyond the outfall to see what becomes of the waste water. Don't forget the costly lesson of the March floods.

The increased output of hydrated lime seems to be well taken up. In fact, the demand grows faster than the output. Hydrate has proved to the dealer its profit-making advantages, and he usually moves that way.

When the average building operation gets put down to the basis of a business, and ceases to be played as a game, the dealer will not need to worry about his credits as much as he does today. As long as it is a game, the dealer is forced to sit in and play.

There is no use grumbling at the tax rate so long as everybody feels it encumbent upon him to petition the legislature and the congress for appropriations. It is the demands of the people as the law-makers see the case that brings forth the appropriations, and they in turn make the tax rates, and in the exact ratio. If we can do without the one, we will never be confronted with the other. Silah!

Baseball is our national game and it is good for nothing unless for the purpose of working out object lessons of the value of team work. It's a pity that the building material contingent are too busy during the ball season to attend the games and get the lesson. Needless clashing of the pails spills so much milk that it makes a shortage of cream at profit-taking time. Selah!

Suffragettes will have the whole country before long, and what will the pin-head, peanut calibre politician do then, poor thing? The running of a big government is only the same thing as house-keeping on a mammoth scale. If you want to know what the difference in public economics is going to be when the women are on the job, just note the difference in the size of the returns when you go to market alone and when your wife goes with you. There's no use talking, the women have got it all over us when it comes down to practical economics. We have all got to admit that mother's way was the best way we knew, so here's for confidence in the women influence.

Workmen's compensation laws have been passed by many of the important industrial states, and there is a very pronounced similarity about all of them. The basic idea that every worker is indirectly serving society at the same time he is gaining his livelihood is very broad and very high minded. Through the compensation acts society by the good right arm of the legislature indirectly seeks to recognize the service and increase the pay of the worker by paying for him his liability insurance, by directly charging the expense up to each workman's employer. Of course each employer immediately seeks the means to charge it right back to society in the shape of increased prices. Net result makes a tremendous increase in liability insurance, the liability insurance companies profit immensely thereby, and nobody else makes anything that anybody knows about. Are not the insurance ringsters guilty of milking industry again with plausible if not charitable pretenses?

EDITORIAL CHAT

John W. Dunn is the new auditor of the Bartlett Supply Company, of Detroit, Mich., having recently been appointed to that position.

Charles Schneider recently became representative of the General Fire Proofing Company, of Youngstown, Ohio, for the state of Michigan. He has offices in Detroit.

The Chicago office of the Bucyrus Company, 622 McCormick building, is now in charge of Samuel E. Elmore, as central sales manager. He takes the place of Carl Horix, who recently tendered his resignation.

W. A. Berger has been elected manager and superintendent of the Watsontown Brick Company, at Watsontown, Pa. He will succeed Messrs. W. H. Hill and J. C. Fowler, who have recently taken charge of the Paxton Company, which is located near Watsontown.

J. A. Tormey, of 602 North Thirty-second street, Philadelphia, Pa., has left the employ of the United Brick & Clay Products Company of that city, and will start in business for himself, handling a full line of clay products.

On May 20, Denver, Colo., adopted the commission form of government. The work formerly conducted by the Board of Public Works, and the Engineering, Highway, Street Sprinkling and Street Cleaning departments will now be done by the Commissioner of Improvements.

S. J. McClune, of Johnstown, Pa., has been elected general manager of the plant of the Savage Fire Brick Works at Meyersdale, Pa., and improvements are contemplated immediately which will increase the production of the property. Work with this end in view will be started as early as possible.

Edward J. Conley, Western sales manager of Best Bros. Keene's Cement Company, recently returned from a trip through the Northwest and reported that conditions were "lovely" in that part of the country. "Business," he said, "is going forward with a rush." He expects to spend the next few weeks in the extreme South.

George B. Gardner, for several years connected with the building supply firm of the D. J. Kennedy Company, Pittsburgh, Pa., has severed his association with that concern, and has formed a connection with the United States Gypsum Company at Cleveland, Ohio. Mr. Gardner has been succeeded in the Kennedy offices by A. W. McClure, who has been with the American Sewer Pipe Company.

A few days before going to press we were honored by a visit from our old friend, Al. Gallagher, and his business associate, R. S. Phillips. It is always a pleasure to have Mr. Gallagher call upon us, as he invariably "leaves us smiling when he says goodbye." Mr. Phillips will represent the National Retarder Company in Webster City, Iowa, and from all accounts is entirely capable of holding such a position to the complete satisfaction of all parties concerned. He is thoroughly conversant with the gypsum, plaster and retarder business, having had wide experience throughout the West, including Oklahoma, Nevada and Utah.

A recent decision of great interest to the cement mills of the Lehigh district was handed down by the Interstate Commerce Commission at Washington, in favor of the Allentown Portland Cement Company against the Philadelphia & Reading Railway Company, Central Railroad of New Jersey, Delaware, Lackawanna & Western Railroad Company, Erie Railroad Company and Pennsylvania Railroad Company. The rate on Portland cement from all other mills of the Lehigh Valley district to Jersey City has been 80 cents, while the rate from Evansville, on the Schuylkill and Lehigh branch of the Reading Railroad, which is the shipping point of the Allentown company, has been \$1.35. The Allentown company protested to the commission, alleging discrimination to the extent of 55 cents a ton. The commission decided in favor of the Allentown Cement Company.

F. W. Bryson, formerly superintendent for Mexico Brick & Fire Clay Company of Mexico, Mo., has resigned to accept a position with the Hydraulic Press Brick Company at its Porter (Ind.) plant, where he is in charge.

S. E. Worrell, a well known rotary fire drier manufacturer of Hannibal, Mo., writes that business is especially brisk and that he is devoting a goodly portion of his time to manufacturing export driers which are sold in all parts of the world, especially in the South American countries.

E. P. Hugs, who represents the Sandusky Portland Cement Company in central Illinois territory, was a caller upon Rock Products the latter part of June. Mr. Hugs reports the call for the famous Medusa brand of cement, manufactured by his concern, as being of fair proportions. He mentioned conditions in his territory as being satisfactory, but that prior to that time a drouth lasting over ten weeks had put a damper on the demand for all manner of building materials. However, since the much-needed rain has come things are opening up in fine shape.

The Webster Manufacturing Company, Tiffin, Ohio, begs leave to announce that Mr. T. K. Webster, for many years its president and one of the principal stockholders, has severed his connections with the company. The personnel of the board of directors and officers is as follows: F. S. Shaw, president; A. T. Perkins, vice-president and general manager; Alex. Kiskadden, vice-president; Charles S. Clarke, treasurer; L. H. Webster, secretary. Board of directors: F. S. Shaw, Chicago; A. T. Perkins, Tiffin, Ohio; E. P. McPherson, Chicago; R. D. Sneath, Tiffin, Ohio; Charles S. Clarke, Tiffin, Ohio; Alex. Kiskadden, Tiffin, Ohio; George D. Loomis, Tiffin, Ohio.

Harold Penfield, assistant treasurer of the American Clay Machinery Company, seems to have qualified for a Carnegie hero medal during the recent Ohio flood, when, in a collapsible canoe, he rescued three men from the Sandusky river, at Bucyrus, Ohio. Mr. Penfield learned to handle a canoe at Cornell University, and this fact came to an unusually good purpose. A boat containing F. J. Barth, H. B. Sears and E. G. Reid capsized in the flooded Sandusky river, their position being made much more serious, through the swollen condition of the water and the amount of wreckage the swift current carried. The frail canvas canoe was not an ideal life-saving craft, but it served its purpose, aided by the skill of young Penfield.

The many friends of E. H. Michel, manager of the New Orleans branch of the Salmen Brick & Lumber Company, has been appointed vicegerent snark of Hoo Hoo for east Louisiana, and will be an active factor in the big concatenation of that organization to be held in New Orleans on August 9, with the De Soto hotel as headquarters. Mr. Michel has been in active charge of the affairs of the New Orleans branch of the Salmen Brick & Lumber Company since the death of Jacob Salmen, his record made in his position of manager standing as a monument to his ability. He now is president of the New Orleans Builders' Material Dealers' Credit Association and of the Retail Lumbermen's Credit Protective Association, having been recently elected vice-president from Louisiana of the National Builders' Supply Association. He is devoting his endeavors to the direction of energizing the Hoo Hoo in Louisiana, and is meeting with much success.

"Colonel" Light, of Virginia, Sah! but more recently of Washington, D. C., the indefatigable standard bearer of the American Road Congress which is to meet at Detroit, September 29th and for two weeks following thereafter, was in Chicago the other day. He reports the most enthusiastic interest in every section that he has visited in the coming roads congress, saying: "The principle of road improvement is so deeply grounded in the minds of the people at the present time with such a firm conviction that all are in favor of improving the road systems of the country, and there can be no doubt that the road congress will be one of the greatest events of the year. The spaces in the exhibit feature have practically all been subscribed for by the producers of road materials and the builders of road machinery. The remarkable growth of interest in the road question seems to have only begun and it can never be ended until the road systems are worked out and in a fair way to completion. It is nation wide in its application and is not confined to any one class of cities, but all seem to be unanimous in the demand for a complete system of good roads from ocean to ocean."

JOTTINGS OF A. S. T. M. MEETING.

A. V. Bleining, whose study of pottery glazes has just about got everything beaten from old Egypt and old Babylon down to the present day, is somewhat of a sailor and, like Simon Peter, he is a fisherman—especially off the coast of Atlantic City, where the American Society for Testing Materials is wont to hold its meetings. But like Simon Peter, he cannot walk on the water, even if he can sprint on the sand.

Now Wig, who is also a member of the technical staff of the government's Pittsburg laboratory, would not trust himself to a sail boat for anything nor he would not go swimming; but Bates, who could think of more names for the combinations of silicates than are to be found in Portland cement than are contained in anybody's Latin lexicon, took a dip in the ocean, and in fact the whole technical staff of the government, including Voorhies, went to examine the action of sea water on various substances. The report has not yet been written out, but Purdy, the biggest man from Massachusetts, and Kinney, of the Universal's technical staff at Pittsburg, expect to have the report ready with a typewriter for the next annual meeting.

The cement delegation was very well represented at the Atlantic City meeting, June 24-28. There were Ed. Boyer and Harry S. Seamans, of the Atlas Portland Cement Co.; Carl W. Boynton and William Kinney, of the Universal Portland Cement Co.; Bert M. Swett, E. S. Larned and one or two more of the Lehigh Portland Cement Co.; Ray W. Hilles and Joseph Brobson, of the Dexter Portland Cement Co.; Albert Moyer, of the Vulcanite Portland Cement Co.; Percy H. Wilson and Louis R. Ferguson, of the Association of American Portland Cement Manufacturers, and many more of the technical men. Besides, there were Messrs. John B. Lober, William G. Hartranft, Robert W. Leslie, Robert W. Griffith and several others who only stayed a little while at the great technical meeting of the heavy artillery of cement.

Prof. Carpenter of Cornell was at the meeting all of Autoclave day, and what he had to say was the clinching part of the discussion while he was present.

Prof. Marburg, secretary of the American society, is worthy of the high position that he holds, by reason of the splendid organization which he has perfected for the conduct of the business of the society, as well as for the pleasant comradeship which pervades all of the sessions and the social features.

The election of Prof. A. N. Talbot of Illinois University for president of the society was well taken for an organization of such national importance. He is the first president from the middle-west to be chosen as the head of the great technical society.

Victor Bentner has been appointed receiver for the Lumberman's Cement and Brick Co., at Carlisle, Kans. He was formerly manager of the plant.

Several kinds of explosions took place in the Senate at Springfield, Ill., a few days ago during consideration of House Bill 583, known as the blasting bill, and introduced by Representative Costello. So violent were the concussions that the bill was killed, 43 to 0. It provided that no dynamite should be used within the Chicago city limits.

Mr. Henry W. Classen, of the Maryland Lime & Cement Company, Baltimore, Md., has been absent from his office since June 7, owing to severe illness. He is not now able to take up his duties and in consequence Chas. H. Classen, of the Maryland Lime & Cement Company, is taxed to the utmost in connection with the management of that important concern.

Walter Linnenbrink, aged 25, assistant sales manager of the New Castle Portland Cement Co., at New Castle, Pa., was shot twice by Norman Vandivort, his discharged stenographer, it is charged, June 19th and died the following day. He was one of the most popular men in the cement business in western Pennsylvania and was well known in Pittsburg.

Prof. Arthur Newell Talbot was elected president of the American Society for Testing Materials at its sixteenth annual meeting at Atlantic City, N. J., June 24-28. Prof. Talbot was born in Illinois Oct. 21, 1857, and after graduating from the civil engineering course of the University of Illinois in 1881 he engaged in maintenance and construction work in the West until 1885, when he returned as a member of the faculty of the university. Since 1890 he has been professor of municipal and sanitary engineering. He has been a member of the American Society for Testing Materials since its formation and has been active in its development, serving for the past year as vice-president.



VACATION'S VEXATIONS.

I

First you get a bunch of folders, and peruse them all with care,
Then you check fifteen or twenty, and look up the railroad fare;
After which you write a letter to the names that suit you best
Such as Clover Lodge, Pine Forest, Muskie Inn or Swallow's Nest.
Then the answers pile upon you, and your troubles just begin,
Everyone describes the ideal place to spend vacation in;
Each has golfing, rowing, bathing, resting, tennis, lots of fish,
And each states its main ambition is to grant your every wish.
The family argues pro and con, and then in desperation
You choose a place at random, and prepare for your vacation.

II

On the day you start it's cloudy, and before you reach the train
Inside-out goes your umbrella, and your suit is soaked with rain.
Then your reach your destination, miss connections with the bus,
And your wife disdains to speak to you, because forsooth, you cuss.
You hunt an hour around the village, hire a horse that costs you five,
And at last you both are started on a rainy five-mile drive;
Tired and wet, forlorn and hungry, fit for almost any crime,
After dark you reach the cottage just an hour past supper-time.
Some cold boiled ham is hurried out, you eat it with vexation
And go to bed dead homesick on the first day of vacation.

III

In the morning after breakfast, you quite casually inquire
About tennis, golf and fishing, and if rowboats are for hire;
But they tell you that the golf club is a mile or two away,
Though the dues are just a dollar per to play there by the day.
Then for fish you should have come of course a month before about,
But the tennis court is ready if you care to mark it out.
You decide to stay the limit, make the best of what you've got,
Because it's easier than moving, and find worse as like as not.
At last, hurrah! you're home again, and with what wild elation
You greet familiar landmarks after your two weeks' vacation.

'T WAS EVER THUS.

The lady jury had been out for hours. The judge was tired and weary, the loungers exhausted and the attorneys worn to a frazzle. Finally the jury announced that it was ready to report and the women filed in.

"Have you reached a verdict?" said the judge, weakly.

"Sure. Twelve of them," said the forelady.

A funny old bird is the pelican,
His bill can hold more than his belican;
He can tote in his beak
Enough food for a week,
But I'm hanged if I see how the helican.

—Square Deal.

A vacation is the best way to beat the doctor, the embalmer and the nerve specialist, and it beats the best tonic ever put up. But like tonics, you only need vacations occasionally.

TALKING IT OVER.

Hello, George! Yes, just got in this morning, and the old berg looks pretty good after a couple of weeks up in the woods. To tell the truth, I'm glad to get back to running water, a Christian bathtub and bureau drawers.

We had a great time at that, though—golf, tennis, fishing and three square meals per day—and your Uncle Dud was at the table at the first stroke of the gong.

Sure, at a farm; cows, hens, barnyard—a regular, sure-enough farm.

Some funny things happened. The first night we landed, John, the hired man, went out to milk, and Mrs. Sinclair, who knows as much about farming as a steer about Sunday school, went out to see what it was all about. After half an hour she came back, told us all about the sheep and pigs, and you would have thought she had been to the circus. Here's what she finished with: "You know, everything is new to me out here, and I simply adore it. I'm going out every night and hear John page the cows." Can you beat it?

Listen! We had some great fishing, but I had a close call from being separated from twenty-five cold dollars. Up there, every nonresident of the state has to have a fishing license. The first day I scouted around for one, but didn't run across the man who did the issuing, so bright and early the next morning I started out and thought I'd take a chance. It's about a mile from the farm to the lake, and yours truly trudged along with his pole on shoulder and a little can of bait in his pocket, thinking of the days when there was nothing to do but fish and eat, and the greatest trial of life was a stone bruise. Well, I went whistling down the road, when an old codger came along riding a bicycle. "Morning," said he, and got off his wheel. "How's fishing up here?" said I, innocently, and by way of being friendly. "Fine," said the old boy. "Do you live around here?" I told him I came from Chicago, and then he handed me this: "Well, well, I suppose you have your fishing license. I'm the fish warden." I told him joyfully and as enthusiastically as I could that I was that minute on my way to look him up, and he grinned and pulled his book out of his pocket, and took Bertillon measurements of my manly form.

Lucky? You bet! If I had been ten minutes later the three fish I caught that morning would have cost considerably more than they were worth, for half an hour later he rowed out in a boat and nabbed a man about fifty feet from our boat.

There were some other funny people besides Mrs. Sinclair. There was a minister who had a brand new story every morning, and served one about an hour apart all day. He was a pretty clever boy, too. A traveling salesman sat next to him at table, and the first morning at breakfast I heard them talking, and finally the drummer asked him what his line was, not knowing he was a dominie. "Well," said the reverend, "I'm in the insurance business. Life, with a side line of fire." Everybody roared—but the salesman, it went right over his head.

But, say, old man, there's nothing like getting away from the office now and then to get a man's system cleared out. I gained ten pounds, and my wife says my nervous system is in far better shape. She says she can almost stand me around the house now. And work! You can shoot it at me with a gattling gun now, and I'm ready for it.

Drop in Wednesday and we'll have lunch together, I've got to get busy now and get things going straight again.

After all, the two ends of a vacation are the best. When you go you are everlastingly glad to get away from work for awhile, and when you return you are equally glad to be back on the job again.

You meet them all at a summer resort—the golf fiend, the tennis fanatic, the fishing lunatic, the lady who thinks she sings, the one who tries to tear all the front teeth out of the piano, the loving bride and the doting groom, and last but by no means least the elderly spinster who quotes Maeterlinck.

There was a young man who kept wishing
That he could go way up North fishing,
He bought a ten-dollar reel,

And a rod strong as steel,—
And the poor cuss caught three perch and a blue gill. Curses!

WHAT IS THE MATTER WITH OUR BUSINESS?

Gentlemen: In diagnosing the troubles of the Rock Products industry in an endeavor if possible to efface from our map the things that are standing in the way of greater progress, more substantial life and a greater prosperity to the individual elements and a happier existence of the whole industry, we are confronted with the very fact that there is absolutely no team work, nothing like coöperation in the business. The manufacturer of cement for instance is so anxious to turn a trick that will sell a carload today that he will, through his sales organization, choke a customer out who pays his bills and uses cement to make a commercial product, and the result is that the growing collateral line stops growing, no matter if it is the best possible product, and this by the same concern that sells him cement.

This same condition has come up in the plaster industry and amongst stone operators, who forget the other fellow entirely, and the result is instead of the creation of a lot of millionaires it is a necessity to hire a Burns detective agency to find them in the industry. The Lord has given us the finest raw materials at practically a minimum cost that makes possible the manipulation of those materials so as to produce a fireproof building with all the tensile strength and other qualifications that makes a home and an office habitation of comfort at a minimum cost, and yet here we are as an industry, and as individuals of that industry, fighting among ourselves, not really by design but by carelessness, by thoughtless instruction to salesmen, and even the executives themselves are so wrapped up in their own order getting that they neglect to take care of the customer that would grow into a big consumer.

The same thing applies in the contracting game. Take a city, any one, for instance, Chicago. How many responsible contractors are there in Chicago? It is not always their fault, they don't always get the backing up that they deserve. Piracy is more prevalent in our trade than it was on the high seas one hundred years ago. The dealers' trade is disturbed time and time again by the manufacturer, notwithstanding the purchase of 12, 20 or 50 cars a year, who makes it his business to hop on the first big job that is in his county or section, giving an excuse sometimes that the nearest dealer does not buy his brand of cement. And, on the other hand, we have the dealer who is so narrow minded and so hoggish that he insists on getting all the brands he can get and then pushing the brand that he can buy the cheapest and get the most out of.

We have a great industry; we have great men in it and its possibilities are boundless. Here we are walking along, carrying our little burdens without fellowship or coöperation, and the result is that our materials are sold on a margin that don't even smell of prosperity. We can look about us and see smaller industries, men of less caliber, with shorter possibilities for market prosper because they are big and broad enough to coöperate with each other. The days of the "go it alone" way is past. Any industry that does not believe and act and feel and breathe coöperation must die from lack of profit and prosperity.

What are you going to do about it? Are you going to still continue to operate your yard or your cement mill or your sand bank on that old fashioned cut-throat method, or are you going to try to be a good Indian and coöperate with your fellows?

Gentlemen, our trade organizations are a joke. We do gain by mixing with each other, in education and broadening our vision of the commercial conditions, but we don't go far enough. We have never yet dehorned the black specter that whispers in your ear "this man is a crook" and "that man will take away my hearth stone" if he has an opportunity, but as a matter of fact he is merely trying to make his own living honestly. It is a burning shame, the present methods applied in our industry. If you want instances we will give them to you, and we are going to give them to you from now on until the first of January next. Either we must apply decent methods in our industry and recognize integrity of purpose and sincerity of action, or we had all better go into the picture show business or some other line to get close enough to the people to get the money direct, even if it is only five cents a peck.

A rustic bench is picturesque, and all that, but did you ever try to sit on one for an hour?

And the mosquitoes—words fail us, so we won't mention them. We couldn't do the subject justice, for the editor wouldn't print what we'd like to say.

FOR THE RETAILER

NEW WISCONSIN LIEN LAW.

Attorney John C. Thompson, of Oshkosh, explained the new Wisconsin mechanics' lien law at a recent meeting of the Oshkosh Builders & Traders' Exchange, says The Improvement Bulletin. In his address Mr. Thompson said the statute in regard to mechanic's liens has been changed in several important particulars by chapter 213 of the laws of 1913. "In the first place," he said, "the lien of the materialman who furnishes materials to a contractor is now taken away, unless:

"Within ten days after the actual delivery of the first material he gives written notice to the owner or his agent personally, if they can be found, if not by mail, and by filing with the clerk of the court the fact that such materialman has commenced to furnish such material or labor, and that the owner will be liable therefor and his property subject to a lien in case the contractor fails to pay therefor. The notice should also describe the property on which the materials are to be used.

"If such notice is not given within ten days from the furnishing of the first materials, a notice subsequently given will protect the materialman to a limited extent, that is, he will then be entitled to a lien only to the extent of the amount then owing from the owner to the contractor, and only for the materials furnished subsequent to the time of serving the notice.

"In case no such notice is served but only the notice given required by the old statute—that is, within sixty days after the completion of the furnishing of material—the material man will have only a lien to the extent of the amount then owing from the owner to the contractor.

"In case of the giving of the ten days' notice it must be remembered that a further notice must also be given within sixty days after the completion of the furnishing of materials, as under the old law."

SAN FRANCISCO MARKET QUIET.

San Francisco, July 12, 1913.—The building situation is rather quiet in most of the larger cities of the Pacific Coast, the June record in San Francisco being less than for May, and about \$380,000 short of June, 1912, while Los Angeles shows a similar decrease. San Diego, however, shows considerable activity, with a June record of \$1,018,700, compared with \$669,163 for June of last year, and \$385,995 for May. Values are also unusually large in several country towns, and retailers at many outside points find business above expectations. Financial conditions have caused some delay in work on some of the larger projects for irrigation and power development, but there are prospects of an early revival in this line. Collections lately have been slow, but firms that are in a position to extend credit can get all the business they want. There is no apparent overproduction, and prices are firmly held in most lines.

W. S. McLean, sales manager of the Holmes Lime Company, says: "Conditions in general have been rather quiet for the month of June, but there are indications of improvement from now on. The quietness is simply due to the financial stringency, which we suppose is national as well as local. Our lines have been moving very well."

The Pratt Building Material Company, which has been in business only a few months, is making rapid headway in this market. The enterprise was started by C. F. Pratt, president and manager, who had for seven years been manager of the Golden Gate Brick Company, and offices have been opened at 205 Examiner building. The company has the agency for the Sacramento Clay Products Company, formerly the Silica Brick Company, Sacramento, Cal., and also does a general business in sand, gravel, lime and other materials. A new gravel pit has been opened by the company at Austin Creek, Sonoma county, with a capacity of 10 cars daily, from which shipments are made through northern California. This pit will soon be enlarged. Mr. Pratt reports great success with the products of the Sacramento brick firm, including pressed, wire-cut and fire brick and partition tile.

O. M. Zeis Lumber Company, Chicago; dealing in building materials; capital \$25,000. Incorporators: V. S. Ringquist, G. S. Dahlberg, A. Dahlberg.

PROPOSED BILL TO AMEND SECTION OF LIEN LAW.

A bill was introduced by Mr. Jayne at the April session of the Illinois legislature for an act to amend section thirty-seven of the present lien law. The bill specifies that any architect, contractor, sub-contractor, materialman or other person furnishing services, labor or material for the purpose of or in constructing, building, altering, repairing or ornamenting a boat, barge or other water craft, automobile, motor bicycle and other motor vehicles not running upon rails or tracks, shall have a lien upon such boat, barge or other water craft, automobile, etc., for the value of such services, labor or material. Such lien may be established and enforced in the same manner as liens are established under the present lien law, and the parties shall be held to the same obligations, duties and liabilities as in the case of a contract for building, repairing or ornamenting a house or other building. The bill is known as "House Bill No. 674," and was read by title only and referred to the committee on judiciary.

The firm of Bailer & Lewis has been formed at Lancaster, Ky., for the purpose of handling lime, cement and other building supplies. Both members have had experience in that field and will go after business aggressively.

The Puget Sound Cement & Lime Co., capital stock \$3,500,000, has been incorporated with headquarters in Seattle. Its first trustees include Victor C. Coxhead, Austin E. Griffiths, Alex. Polson, George W. Allen, W. Thaanum, Hans Pederson and C. P. Bissett.

Peterson Mfg. Co., Clinton, Iowa, has been incorporated, with a capital stock of \$10,000; to manufacture, buy and sell clay, cement or iron piping. Officers: President, J. M. Peterson; vice-president, William C. McGinn; secretary, John L. Wolfe, and treasurer, Gustav Goddard.

What is said to be a fireproofing fluid has been invented by Dr. Kimball, of Chicago and Camden, Ark., and is made from the white clay which abounds in Ouachita county, Arkansas. With the use of chemicals the clay is dissolved and forms a colorless liquid which, when applied to cloths by the dipping process, is said to render it fireproof.



MID-SUMMER DAY'S DREAM.

NOT EVEN AS A GIFT.

The success of the business of the dealer in building materials depends upon the facilities for the promptness of delivery more than any other one factor of his organization. This is well known and too firmly established in the minds of the readers of ROCK PRODUCTS to need any further expression. Each man in the business knows it the same as he knows his own office cat. There was a time, and not so many years ago, when the cost of teaming was not taken seriously into consideration in the establishments that handled building materials in even the largest cities of the United States.

In view of the prevailing methods of bookkeeping the present-day systems of conducting accounts and transacting business it seems to be almost impossible. Yet in a recent interview with one of the staunchest old friends of the paper the writer was surprised to hear a statement about as follows:

"Forty-four years ago when I first became connected with this concern, being at the time a mere boy, but a husky lad at that, about the first thing that I was called upon to do was to act as delivery clerk at the warehouse. My duties consisted in taking orders that came from the office by the messenger boy and assisting the negro drivers to load the drays. I was proud of the fact that I could roll more barrels of cement, lime, salt and other commodities on the drays than any of the drivers; in fact I assisted all of them in completing their loads and after checking the loads gave the driver a delivery ticket. In those days we did not use four-wheeled wagons to any great extent, but the old two-wheeled flat dray with handspikes placed in holes in the after-skid which nearly reached back to the ground were used and the dray was invariably pulled by one horse or one mule, as the case might be."

The writer not being familiar with such a vehicle secured a better description and has afterwards found out that the vehicle referred to is what is known as the old English and Dutch porters truck. It has a beam between two low wheels with a pair of skids almost trailing to the ground and a pair of shafts. It is a splendid vehicle for handling materials that are packed exclusively in barrels and at the time mentioned all building materials were packed in barrels, for the machine loom had not been invented to make cotton or jute bags cheap enough for such a purpose. In fact, red oak six-hooped barrels were made by hand by the coopers at the cement mills and at the lime kilns in those days at a cost of 18 cents to 22 cents each, because the agriculturists in those days were paying the woodsmen for moving the trees so as to clear up the land and there was no cost whatever attached to the timber for the making of barrels. Hemp bagging was manufactured on a small scale to supply the cotton plantations of the South, but the supply was always enough for the demand. Cotton cloth such as is used for cement bags now was unknown, but a similar cloth woven from handspun yarn was worth 25 cents to 30 cents a yard.

The Philippine Islands had not been discovered as far as this country was concerned commercially, so that Manila bagging had never transpired and the barrel was by long odds the cheapest and only available package for such materials as cement, lime, fire-clay and other building materials. These little drays are in fact wonderful vehicles for short hauls such as from the vessels side to the warehouse a few blocks away, or from the warehouse to the building job which would be only a few blocks away, because the little truck can be cheaply loaded and can be drawn by one horse carrying two to three thousand pounds at a trip very conveniently. Nobody thought of such thing in those days as figuring the number of trips that a dray could make. Just so the driver kept busy all day and the horse kept moving, it was considered a busy day and the cost per barrel of delivery was never even considered, as the firm owned the dray, owned the negro or hired him by the year, and the customers expected goods by dray because they were too heavy to carry home on their shoulders.

In those days the cost of timothy hay ranged from \$6.00 to \$7.00 per ton; oats were sold for 11 cents to 14 cents a bushel and corn from 20 cents to 25 cents a bushel, and usually the dealers in builders' materials of that period also handled corn, oats and hay as part of their stock in trade. Probably if those early dealers in builders' materials had the same kind of bookkeepers that their successors of the present day now have, the profits of those early times would diminish to a very large extent from the percentages which the oldest representatives of the trade are wont to consider and were the fashion in the days of their youth.

Probably the cost of the negro drivers or the cost of those one-horse trucks were never put into the expense account, together with the feed consumed by the work animals which would have made a very substantial deduction from the profits that were made by the concerns which never took such trivial things into consideration at all. Nevertheless this same concern today works a number of four-wheeled wagons with two-horse teams and they have a very exact system of checking and accounting for practically every turn of the wheel and every step of the horse. They are now just introducing their first automobile truck and will probably have more of them as the experience from the one now used experimentally makes a record to guide future purchases in the direction of motive power.

This little glimpse of the history of the builders' supply business is only given to show what remarkable changes take place in the history of an establishment which succeeds year after year in the same line of business in the same place. From the two-wheeled little dray of forty-four years ago to the grand automobile truck of the present day is a mighty step, and it has been brought about more by the introduction of intelligence and a deep study of the conditions of the business than by any other means. The automobile is undoubtedly the greatest innovation of modern times and has a more distinct and definite bearing on the success of the builders' supply business of the future than any other factor. Not even the cost of the manufacture of cement, lime, plaster or any other commodity can so effect the quotation of its prices delivered at the job as can the factor of the cost of transportation from the warehouse to the job, and that problem is solved by the automobile provided the equation is intelligently, carefully and systematically worked out so as to give the truck the economy that the automobile makes and to secure them as a return on the investment in the automobile truck.

This statement can be illustrated by an interview which the writer recently had with A. W. Hayes, of Joliet, Ill. Mr. Hayes has been in the builders' supply business in Joliet since 1882, and up to one year ago, his delivery department had been operated exclusively by means of teams. Five teams constantly trucking means twelve horses to be constantly fed and cared for. Mr. Hayes says that in the year that he has been using two automobile trucks, he has completely displaced and retired his teams and wagon. The two automobiles deliver twenty-five per cent more building material promptly to the customer than he has ever been able to do with five wagons and five teams, and the cost has been materially diminished by the use of the automobile in spite of the fact that each of the automobiles represent an investment of \$3,500.

Mr. Hayes remarked that he would not accept the

best pair of horses that ever stood beside a pole to a yoke as a gift, because in the year that he has been using automobiles he has found that the deliverance from the sick horse, from the regular bill of the horse-shoer, and from the steady and constant drain of money for horse feed, for the up keep of the stables means an investment which is unknown to the man who can turn the key on his automobile in the garage and leave it over Sunday without either water or feed. In case the teamsters go out on a strike practically any of the clerks in the office can deliver as much goods as the chauffeur. The automobile driver has been created in the establishment by selecting two of the most reliable drivers who used to handle teams. Their wages have been advanced and they are proud of the fact that they can deliver goods for both man and team and deliver a greater tonnage than they could before. The entire deficiency of the delivery department has been so concentrated and so much better organized on account of the dependability of the automobile truck, that Mr. Hayes considers the worst feature of the supply business has been done away with and he can now do business in something like pleasure in place of having his mind always in an apprehensive vein, while his teams are tramping around building operations, stepping on nails, going out to hunt up a drunken driver or having all the horses in the horse-shoeing shop just when they are most needed. Besides there are times when the weather is too hot for the horses to work efficiently and again it is too cool; but all the time whether hot or cool the horse is a kind of constant menace, a constant dread and a constant risk. The man who owns a large number of horses scarcely dares to take a night's rest because his hostlers may not feed his teams, they may not give them water and the slightest neglect of this kind would throw all of them out of condition and therefore their value as a department of a commercial institution is temporarily destroyed—and such things happen in times of strikes, in rush seasons and in the middle of the summer when there are excursions and other distracting attractions claiming the attention of the irresponsible workman just when the contractors most want to be served to get their buildings along while the weather lasts.

Thus the automobile eliminates a very large proportion of the human equation and gets the builders' supply business down to one that can be operated by machinery; and we have learned in the century last past that machine operation is the cheapest and most dependable that can be evolved. When an experienced builders' supply dealer in a small city like Joliet voluntarily gives out this kind of testimony in favor of his automobile experience, one can see tremendous influence which the automobile truck is destined to accomplish in the revolution of the



CLEVELAND BUILDERS' SUPPLY COMPANY'S 5-TON PEERLESS.

delivery of building materials. Time and again we have worked out the fact that the automobile can be advantageously used in cities like Chicago, St. Louis, Buffalo, Cleveland, Detroit, Columbus and other places, but when it comes to cities of the size of Joliet—about 35,000—the number of such cities in this country makes the automobile truck business a very interesting feature for the consideration of several thousand men who are now burning up their money just the same as if they opened the stove door and tossed it in by bunches.

It means that a very large number of automobile trucks will have to be supplied to these very dealers, and it may be that a particular type or shape of truck of special design for the needs of the builders' supply trade will be adopted and produced so that the actual final limit of cost per ton per mile that we have discussed so much in the recent past will have been reached, and such a machine broadly offered and guaranteed for the building material men will be used and studied by them economically, simply because he has to do it to keep in the running and make his business pay as much as it has paid in the past. We have observed that the dealers in building material are very prompt to adopt an economy as soon as they can see and apply it, and this great revolution in the delivery department of the building material concerns is right at hand and will be done and finished sooner than any of us can now comprehend.

OHIO LIEN LAW.

The lien law of Ohio, which was passed by the legislature of that state recently and signed by the governor on May 2 to become effective on August 5, contains provisions for the protection of the building material dealer and is hailed with approval by them. It is hoped that the law will have much to do with the elimination of the dishonest contractor, as he will be practically the only one to suffer from its effects. Honest contractors generally are much gratified at the passing of this law and all along lent their hearty support for its adoption.

The Ohio lien law is similar in its purpose to that of Wisconsin, Michigan and other states, and provides that every person supplying labor or material for the building of a structure shall have a lien on the structure or land on which it is located, from the time of the commencement of the building.

The owner must secure from the contractor a sworn statement as to the name of every subcontractor, laborer, material man, etc., giving the amount due each and whether paid or unpaid, before he shall make any payment to the contractor.

A statement made under oath by each subcontractor, naming each workman and the wages due him, amount due the materialmen, whether paid or unpaid, etc., shall be attached to the contractor's statement; and also a statement made in writing from each materialman, setting forth how much is due him and whether the amount has been paid or not.

Contractors and subcontractors are required to furnish similar statements in cases where the owner has made a payment on the contract, the owner being required to retain a sufficient amount to pay for the labor and material not mentioned as being paid in said statement. These statements constitute a legal notice to the owner, regardless of their accuracy, and serve as a protection to the owner. The rights of the persons having the lien, however, shall not be affected by payments made by the owner without requiring said affidavit or prior to securing it.

A notice may be given at any time up to within thirty days after delivery has begun by the person or persons supplying the labor or material, and upon the receipt by the owner he is therefore responsible to the party owning the lien. Where the owner pays out money equally among persons coming within the lien he shall not be held liable beyond the contract price.

The filing of a lien must be made at the county recorder's office not later than sixty days after the last work is done on the job or the material furnished by the person filing the lien, and within thirty days thereafter a correct copy of said affidavit must be served on the owner. It is held lawful to serve all notices by registered mail. Contracts are not affected where made prior to the date the law went into effect.

The Independent Roofing Company, Cleveland, Ohio; W. A. Johnson and others; \$5,000.

Virginia Building Corporation, Richmond, Va., capital stock \$400,000, chartered; H. L. Denoon, president; Nixon Ball, vice-president; James Norton, secretary-treasurer.

EDITORIALS BY OUR READERS.

The management of ROCK PRODUCTS is in no way responsible for statements made or opinions voiced in this department, which is introduced as the open forum for the discussion of those intimate matters connected with the trade which develop as features of importance to the individual.

The Chicago Portland Cement Situation.

Editor ROCK PRODUCTS:

There comes to my desk during each month several so-called dealers' magazines, these magazines being issued by the different cement manufacturers, and in these periodicals the manufacturer expresses a great solicitude for the dealer. So strongly is the dealer urged to talk the merits of, and to sell Portland cement, that a novice reading this class of literature would think that from the sale of Portland cement the building supply man derives his entire livelihood; and believing that the dealer has not given enough thought to this phase of his business and in the hope that he will give it more thought, this article is written.

At the outset, let it be stated that the writer speaks only as a Chicago dealer, and as the best part of his life has been spent in marketing building materials in this city he feels that he can speak with a reasonable amount of authentic information regarding the facts in the case.

The cement companies may have, and I believe they do have, a different policy in their dealings with their country customers, but with that we have nothing to do. What concerns us is the manufacturers' relations to the Chicago dealer.

At this moment the Chicago price of Portland cement, in carload lots, to the dealer or consumer ranges from \$1.60 to \$1.67 per barrel, bags included, and according to the brand purchased. You will note the statement is made that this price applies to dealer and consumer; in fact, instances are not without number where the consumer has been able to purchase for less and on better terms than the dealer.

Nor are conditions any better when it comes to team delivery. The manufacturer will quote direct to the consumer for team delivery, at an advance of from 15 to 18 cents per barrel over what his carload price is, and of course the dealer must follow suit. Now let us see where this leaves Mr. Dealer, using in our calculations the manufacturers' own figures so that we may not be accused of unfairness.

As we have seen, the manufacturers' price in carloads, either to the consumer or dealer, is \$1.60 to \$1.67 per barrel, and where the manufacturer also runs a city warehouse he charges, f. o. b. his warehouse for "pickups," 7 cents per barrel over the carload price, thus estimating and fixing the cost of warehousing a barrel of cement as being 7 cents. Now should his retail customer desire a wagonload or less of cement delivered, 13 cents per barrel more is charged, thereby estimating and fixing the cost of team delivery at 13 cents per barrel; and as a barrel of Portland cement is approximately one-fifth of a ton, it gives to the dealer the "magnificent" remuneration of 52 cents per ton for hauling, distance being no objection.

I venture to assert that the manufacturer cannot hire his own teaming done at the low cost of 13 cents per barrel, or 52 cents per ton, yet he expects the dealer to do it, look happy, get into the band wagon and shout the virtues of Portland cement as being a profit-making commodity. But assuming that the dealer does and can team the product for 52 cents per ton—how is he going to spend the 7 cents allowed to him for warehousing? From this margin he must pay the cost and upkeep of his warehouse, taxes, cost of picking up the empty bags, sorting them over, tying them up, hauling them to the freight depot, prepaying the freight on them back to the mill, and smilingly accept the mill's deductions for worthless bags.

Nor is this all the 7 cents has to stand. The heavy expense of selling and carrying the account, with the usual deduction for bad debts, has to come out of this margin, and to add insult to injury the manufacturer competes with his own dealer for the retail business; and as long as human nature is what it is the customer always prefers to buy direct than through a middleman, and this competition has but one ending, namely, the gradual elimination of the dealer. Already one of Chicago's most prominent cement firms has dissolved, no longer being able to compete as dealers against the manufacturer. It may be said that all this is but the natural evolution of business. So be it; but why, from the dealers' standpoint, should Mr. Dealer help to weave the rope to hang himself with?

The writer would like to see every building supply man in Chicago refuse to handle Portland cement. By doing so he would not be any worse off, and would be dollars ahead, for I do not believe that a single dealer has this year broken even on his cement sales. He may have bought a few bar-

rels early in the season at a lower figure than the present quotation, and by an erroneous method of figuring imagine he is making money, but if he figures what it will cost him to replace what has been sold, he is out. He can only buy for current business, on fifteen-day shipment, and old contracts are supposed to be used exclusively on specified work. The dealer cannot even buy for his current, legitimate requirements extending from sixty to ninety days. We all know that work taking less than fifty barrels extends ninety days and over, yet within the time of starting and finishing this job the manufacturer may have advanced the price several times to the dealer, and yet if the dealer was to list and specify with the manufacturer every little sale of cement of ten barrels or more, he would be compelled to hire another clerk and pay him out of the 7 cents margin allowed by the manufacturer.

This article is written in the hope that the dealer reading it will sit down and carefully figure out where he stands on this Portland cement proposition, and if he does, the writer is confident that he will pass the "buck" back to the manufacturer where it belongs.

A Chicago Dealer.

LOUISVILLE RETAILERS.

Louisville, Ky., July 19.—Local supply men are doing a fairly good volume of business, despite the fact that building operations are not as brisk as could be wished and expected, considering the season.

The Sam F. Troxell Company has been strengthened by the addition of Charles F. Fitch, until recently head of the contracting company of that name. The combination seems to be a happy one, and is garnering a good many valuable contracts, despite the quietude of the building trade. The usual amount of repair work is in sight, and the Troxell Company has four crews working around the city, taking care of roofs which need renovating.

Steel sash business has been a feature of the past month with the R. B. Tyler Company. The Tyler Company represents the Trussed Concrete Steel Company, of Detroit, Mich., in the sash line. The output of the crushed stone plant of the Tyler Company has been sold, and all that is now necessary is a full complement of hands to man the works. This is providing more trouble than would be expected, the darkies who usually work in the plant being averse to too great exertion during the hot weather. President R. Brink Tyler has been forced to dispatch men to Hopkinsville, Ky., and other towns in the hope of augmenting his crew.

Demand is holding up well with the Union Cement & Lime Company, showing a marked improvement during the past few weeks. Secretary F. A. Sampson regards the future as offering better prospects for business than the past few months. A big number of small contracts are being handled by the company. President J. C. Wheat has turned things over to Secretary Sampson, and left for the North, where he will spend a couple of months.

Continental Roofing Company, Chicago, \$9,000; dealing in roofing and roofing compounds. Incorporators: D. M. Cummings, O. S. Gaither and H. C. Saltonstall.

The Fresno, Cal., Builders' Exchange has been incorporated by R. E. Blackwell, H. T. Humphrey, E. J. Farr, H. A. Hansen, W. R. Miller and others, with a capital stock of \$50,000.

The Builders' Exchange of Los Angeles, Cal., has moved into new quarters on the top floor of the Stimson building, occupying the entire floor, which has been finely fitted up for the Exchange's use. Ten rooms are devoted to the regular work of the Exchange, while various material dealers have 21 rooms and a large display hall. The Exchange for some time had a plan under consideration to put up a fine building of its own, but it was decided that this was too large an undertaking for the present, and a ten-year lease was taken on the new headquarters.

The Levensaler-Speir Corporation, Monadnock building, San Francisco, which markets the Colonial wall boards of the Mound House Plaster Company, is also producing a number of building specialties of its own, consisting mostly of various forms of ground rock and mineral. Several varieties of black and gray granite are crushed for sand and pebbles, and a fine white sand is produced from crystal quartz, all these articles being in good demand for special building work. The company controls a number of deposits of raw material, which are worked up at a plant in Berkeley and sold to dealers.



THE AUTOCLAVE TEST.*

Discussion and Disposal of this Interesting Topic at the Sixteenth Annual Meeting of the American Society For Testing Materials.

For several months the topic now known as the Autoclave test of Portland cement has been a most interesting one for discussion with the manufacturers of Portland cement, as well as a few of the prominent engineers who have the specification of materials in railroad work particularly. Mr. Force is a chemical engineer in the employ of the Delaware, Lackawanna & Western railroad, living at Scranton, Pa. He conceived of the idea of producing another kind of test to which cement might be subjected with beneficial results and adopted the same in connection with his own operations.

The Results Obtained With the Autoclave Tests for Cement.

By H. J. Force.

The object of this paper is to give the results of tests on various brands of cement, some of which failed to pass and others of which passed the autoclave test.

The autoclave test is made as follows: Three

TABLE I.—RESULTS OF TESTS ON CEMENT FROM MILL NO. 1.

Number of Cans Represented	Tensile Strength, lb. per sq. in.	Autoclave Test			Tensile Strength of 13 Bricks, lb. per sq. in.	Chemical Composition					
		Increase	Decrease	Expansion, per cent.		SiO ₂	Fe ₂ O ₃	Al ₂ O ₃	CaO	MgO	SO ₃
1	432 636 51 85	0.15	0.28	0.15	429 480 480 130 1.45						
2	430 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
3	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
4	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
5	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
6	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
7	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
8	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
9	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
10	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
11	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
12	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
13	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
14	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
15	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
16	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
17	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
18	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
19	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
20	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
21	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
22	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
23	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
24	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
25	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
26	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
27	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
28	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
29	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
30	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
31	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
32	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
33	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
34	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
35	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
36	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
37	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
38	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
39	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
40	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
41	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
42	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
43	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
44	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
45	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
46	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
47	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
48	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
49	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
50	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
51	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
52	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
53	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
54	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
55	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
56	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
57	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
58	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
59	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
60	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
61	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
62	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
63	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
64	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
65	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
66	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
67	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
68	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
69	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
70	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
71	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
72	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
73	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
74	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
75	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
76	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
77	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
78	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
79	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
80	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
81	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
82	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
83	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
84	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
85	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
86	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
87	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
88	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
89	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
90	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
91	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
92	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
93	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
94	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
95	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
96	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
97	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
98	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
99	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						
100	432 636 51 85	0.20	0.28	0.15	429 480 480 130 1.45						

neat briquettes are made up, using water which gives a normal consistency on the Vicat needle of from 7 to 10 mm. The briquettes are kept in the damp closet for 24 hours, at the expiration of which time they are removed from the molds and placed in the autoclave. Sufficient water is added to partly or wholly cover the briquettes, and the instrument closed. The burners are of sufficient size to raise the pressure to 295 pounds in not more than one hour, and this pressure is maintained for one hour longer, or a total time of two hours. The pressure is then gradually released, the briquettes are taken out and placed in the moist closet for one hour. They are then broken in the standard cement testing machine in the usual manner. The results from the various mills are the average of three briquettes.

A 1" x 6" expansion bar is made up with the briquettes and at the end of 24 hours is measured and placed in the autoclave. The bar is removed with the briquettes at the end of the two-hour test.

* Paper read at convention of American Society for Testing Materials, Atlantic City, N. J., June 24-28.

TABLE II.—RESULTS OF TESTS ON CEMENT FROM MILL NO. 2.

Number of Cans Represented	Tensile Strength, lb. per sq. in.	Autoclave Test			Tensile Strength of 13 Bricks, lb. per sq. in.			Chemical Composition							
		Increase	Decrease	Expansion, per cent.	7 days.	2 months.	6 months.	Loss of Ignition, per cent.	SiO ₂	Fe ₂ O ₃	Al ₂ O ₃	CaO	MgO	SO ₃	
6	336 674 40 32	0.55	0.40	0.45	343 522 3	550 550 5	66								
7	338 438 29 85	1.50	353 308 470	454 1.56											
8	338 438 29 85	1.50	353 308 470	454 1.56											
9	338 438 29 85	1.50	353 308 470	454 1.56											
10	338 438 29 85	1.50	353 308 470	454 1.56											
11	338 438 29 85	1.50	353 308 470	454 1.56											
12	338 438 29 85	1.50	353 308 470	454 1.56											
13	338 438 29 85	1.50	353 308 470	454 1.56											
14	338 438 29 85	1.50	353 308 470	454 1.56											
15	338 438 29 85	1.50	353 308 470	454 1.56											
16	338 438 29 85	1.50	353 308 470	454 1.56											
17	338 438 29 85	1.50	353 308 470	454 1.56											
18	338 438 29 85	1.50	353 308 470	454 1.56											
19	338 438 29 85	1.50	353 308 470	454 1.56											
20	338 438 29 85	1.50	353 308 470	454 1.56											
21	338 438 29 85	1.50	353 308 470	454 1.56											
22	338 438 29 85	1.50	353 308 470	454 1.56											
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98	338 438 29 85	1.50	353 308 470	454 1.56											
99	338 438 29 85	1.50	353 308 470	454 1.56											
100	338 438 29 85	1.50	353 308 470	454 1.56											
Average	607 131 54 53	0.27	330 447 480 463	1.26 21 26	10 23	51 86	2 82	1							

his clinker not quite so hard. This produces a cement which contains a very large percentage of di-calcium silicate, which may not be constant in volume, and which would more than likely fail to pass the autoclave boiling test. This cement would probably require seasoning in order to make it pass the regular boiling test.

Briquettes for tensile strength from the various mills have been made up on most of the samples shown, to one year. It is to be expected that the results on cement for long-time tests will be equally as high, if not higher, than on the Standard Specification cements. On the long-time tests for expansion, very little difference or variation has been noted to date. A number of expansion bars have been kept under observation and measured at frequent intervals. It is believed that some time must elapse before any difference will be noted in these bars.

A large number of cylinders and cubes have been made up for compression tests. The results to date indicate that higher compressive strengths are being obtained, as a rule, on autoclave cement. A large number of 2-inch cubes of the various brands have been made up for compression tests, to be made during a period of from one to five years. The number tested to date is not sufficient to draw any definite

TABLE VI.—AVERAGE OF RESULTS OF TESTS FROM MILLS NOS. 1-5.

Mill No.	Tensile Strength, Neat, at 28 days, lb. per sq. in.		Autoclave Test		Tensile Strength of 1:3 Bricks, lb. per sq. in.			Chemical Composition							
	Original	After 28 days	Change in Tensile Strength, per cent.	Loss in Weight, per cent.	Change in Tensile Strength, per cent.			Loss on Fritting, per cent.	SiO ₂	Fe ₂ O ₃	Al ₂ O ₃	CaO	MgO	H ₂ O	
					7 days	28 days	3 months								
1	410	567	37.71	0.12	303	450	47.5	1.63	21.11	10.79	62.40	2.94	1.56		
2	407	531	30.33	0.27	380	447	48.6	1.26	21.50	10.23	61.86	2.82	1.63		
3	372	345	42.54	47.13	1.31	307	440	45.0	1.10	20.83	10.28	60.52	3.51	1.72	
4	349	383	28.96	39.15	1.12	338	402	48.0	1.13	21.40	10.06	60.90	2.96	1.73	
5	310	314	1.29	66.80	1.82	230	302	46.2	0.97	21.31	9.94	61.27	3.25	1.47	

moderate itself to them. The third is, as yet, an unknown quantity, and its value is entirely a matter of speculation and is possibly variable with each cement. It is not detected, as far as my investigations go, by ordinary test for soundness and I am disappointed in Mr. Force's paper, as I had hoped that Mr. Force's further investigations would show a definite relation between the ability of the cement to pass the autoclave test and its subsequent stability or lack of permanent change of volume when used in the work. And in this disappointment I feel all manufacturers of Portland cement will share, for I feel confident that they are equally as desirous as are engineers of the formulation or development of a test which will be positive for determining the freedom from disintegration of concrete or mortars made from their product, caused by the expansion of a portion of the cement after initial hardening.

I have long been of the opinion that certain internal strains may be developed in structures depending for their building effect upon Portland cement by the expansion of the intermediate sized particles of cement. In such cases that the durability of these structures is dependent on the cohesive force developed exceeding the expansive force due to the retarded hydration of the intermediate sized particles. It is to this that I attribute the drop often observed when cement is tested over long periods under tension. While I fully recognize that under actual working conditions concrete would rarely, if ever, be subjected to conditions such as those found in the autoclave tests, this, to my mind, does not constitute a reason for condemning the test, provided it can be shown that there is a relation between the effect produced by these abnormal conditions and the effect of time under normal conditions, but so far, the published results of tests made with the autoclave, including those in Mr. Force's paper now under discussion, fail to show this relation or that cement passing the proposed tests will give greater strength over long time periods.

Considering Table 1, in which all the cement passed the autoclave tests, the average at the six months' period, though incomplete, due to the fact that a number of the tests are not carried to the six months' period, shows a reduction in the tensile strength of 12 lbs. Considering only the tests that extend to the six months' period, we find that the one-third sand briquettes show at three months' tests an average of 462, at six months an average of 462, or no gain. An analysis of the individual breaks, however, shows that out of the eleven tests carried to the six months' period, all of the cements passing the autoclave tests, five show retrogression, while six show a gain.

Considering Table 2 we find that while all cement passed the autoclave test, that the average, including the short time test of cement not carried to the six months' period, show a retrogression of 23 lbs. between the three and six months' period and of the five tests carried to the six months' period, three show retrogression and two show gains.

Turning to Table 3, where, out of nine tests, three failed to show an increase when tested in the autoclave, the average, though incomplete, shows a continued gain in strength up to the six months' period. But of the two cements carried to the six months' period the one showing the largest increase under the autoclave shows a loss of twenty-six pounds, and the one showing a decrease of 1.27 shows an increase of 50 lbs. The same conditions will be found by an analysis of Table 4. The average of all tests show a decrease in strength under tension at the six months' period.

Considering the eight tests which are carried to the six months' period, we find that three showed an increase in strength under the autoclave tests and five a decrease; that of the three cements showing an increase under the autoclave tests, one showed a marked decrease at six months over the three months' period, amounting to 121 lbs., or over 20%. The other two show gain. Of the five tests showing a decrease when tested under the autoclave, two show a decrease and three an increase at the six months' period; the average of the cements passing the autoclave test at three months being 473 lbs.; the average of the same tests at the six months'

period being 447, or a decrease of 25 lbs. Of the five cements showing a decrease under the autoclave test, the average at three months is 460 lbs., while at the six months' period these cements showed an average of 457 lbs., or a decrease of 3 lbs. against 26 lbs.

In Table 5 the average, which again includes a number of results obtained at the seven-day, twenty-eight-day and three months' period which have not been carried to the six months' period, we again see a decrease at the six months' period over the three months' period for average of all the tests.

In Table 5 the average, which again includes a number of results obtained at the seven-day, twenty-eight-day and three months' periods, which have not been carried to the six months' period, we again see a decrease at the six months' period over the three months' period for average of all the tests.

Analyzing the test carried to the six months' period, we find seven showing an increase under the autoclave test and three a decrease; and that the seven passing the autoclave test show an average increase at six months over the three months' test of 3 lbs. Of the three cements failing to show an increase under the autoclave test, we find a marked increase in strength at the six months' period. The average for the three cements at three months being 387 lbs., against 455 lbs. at six months, or an average gain of 68 lbs. for the cement that failed to pass the autoclave test, and it is noticeable that the cement which showed the greatest decrease in strength under the autoclave test showed the most marked increase.

If we accept that there is any relation between the behavior of the test piece under standard laboratory conditions and the behavior of the mortar or concrete made from the same cement on the work, the results of the test given by Mr. Force seem to negative his claim, that cement passing the autoclave test will give better results in the work than cements failing to do so.

I do not wish this discussion to be understood as condemning the autoclave test, for I believe it may have possibilities and shall await with interest further reports by Mr. Force and other investigators which I hope will be coupled with the observation of the behavior of the cement used on the work, but I frankly admit that until such relation is shown, I would not recommend the inclusion of the autoclave test in any specification.

Taking up the explanation given by Mr. Force of the retarded hydration of the coarser granules, I would like to know on what experimental data, if any, this is based. From my observation, any clinker composed largely of di-calcium silicate will disintegrate and fall to a fine powder. The dusting clinker is also easier to grind, and I would anticipate a much greater content of fine flour in a cement made from clinker high in di-calcic silicates than from a clinker in which this compound is largely absent. It is, however, possible that the di-calcic silicate, not by reason of its coarseness of grain, but because it is sparsely, if at all, attacked by water at normal temperatures may hydrate with time and be responsible for expansion.

The thought is a new one to me, and I shall be glad to hear the opinion of others as to the possibility that the retarded hydration of a portion of the cement is due to the presence of di-calcic silicate, even though finely divided as well as to the presence of coarser granules.

Discussion by H. P. Bates

Chemist, Bureau of Standards, Pittsburgh, Pa.

A paper presented at the Sixth International Association for Testing Materials by J. Bied, "On Various Chemical Phenomena Encountered in the Course of Industrial Investigations," contains the following statements:

"Any cement that has stood the hot water test

TABLE VII.—RESULTS OF TESTS OF CEMENT FROM A WESTERN MILL.

Fineness: percent passing Sieves:			Tensile Strength, Neat.			Tensile Strength, 1:3 Ottawa Sand, lb. per sq. in.	
No. 80	No. 100	No. 200	24 hours, lb. per sq. in.	Autoclave Test, Force, lb. per sq. in.	Increase, per cent.	7 days	28 days
95.0	95.1	82.8	363.6	376.7	3.6	299.2	381.4
95.0	95.1	82.8	197.5	355.0	78.7	155.7	379.0
95.0	95.1	82.8	397.5	313.0	29.6	316.2	379.0
95.0	95.0	84.0	418.7	781.0	86.8	341.2	424.8
95.0	95.0	84.0	353.5	334.5	5.6	299.2	379.0
95.0	94.7	83.7	340.0	717.5	111.0	299.2	379.0
95.0	94.7	83.7	241.0	487.5	103.3	299.2	379.0
95.0	94.7	83.7	353.5	536.5	51.2	299.2	379.0
95.0	94.7	83.7	343.0	638.5	86.6	299.2	379.0
95.0	94.7	83.7	278.0	620.5	125.2	299.2	379.0
95.0	94.8	81.0	304.5	632.5	73.3	348.8	403.0
95.0	94.8	81.0	330.0	624.0	78.3	348.8	403.0
95.0	94.7	83.7	242.0	610.0	152.1	299.2	379.0
95.0	94.7	83.9	332.3	397.5	19.6	333.6	393.2
95.0	94.7	83.9	377.0	710.0	87.0	299.2	379.0
95.0	94.7	83.9	274.0	637.5	133.8	299.2	379.0
95.0	94.6	83.2	350.0	467.5	33.6	338.4	410.2
95.0	94.6	83.2	361.5	690.0	91.2	348.8	403.0
95.0	94.6	83.2	340.0	663.0	93.2	348.8	403.0
95.0	94.8	83.2	379.0	465.5	23.3	364.8	466.0
95.0	94.8	83.2	406.0	715.5	76.2	348.8	403.0
95.0	94.8	83.2	367.0	571.0	55.6	353.0	413.4
95.0	94.8	84.1	331.5	423.5	27.7	348.8	403.0
95.0	94.8	84.1	388.5	667.5	71.8	348.8	403.0
95.0	94.8	84.1	351.5	625.0	78.1	327.0	408.8
95.0	94.8	83.8	376.5	312.0	36.0	327.0	408.8

TABLE V.—RESULTS OF TESTS ON CEMENT FROM MILL NO. 5.

Number of Cyls. Represented	Tensile Strength, Neat, at 28 days, lb. per sq. in.		Autoclave Test		Tensile Strength, 1:3 Bricks, lb. per sq. in.		Chemical Composition							
	Original	After 28 days	Change in Tensile Strength, per cent.		Expansion, %	Days	Flexure, lb./sq. in.	Loss in Weight, per cent.	SiO ₂	Fe ₂ O ₃	Al ₂ O ₃	CaO	MgO	Sum
			Increase	Decrease										
1	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
2	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
3	412	598	45.13	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
4	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
5	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
6	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
7	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
8	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
9	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
10	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
11	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
12	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
13	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
14	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
15	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
16	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
17	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
18	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
19	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
20	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
21	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
22	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
23	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
24	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
25	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
26	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
27	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
28	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
29	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
30	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
31	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
32	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
33	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
34	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
35	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
36	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
37	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
38	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
39	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
40	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
41	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
42	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
43	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
44	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
45	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
46	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
47	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
48	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
49	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
50	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
51	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
52	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
53	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
54	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
55	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
56	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
57	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
58	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
59	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
60	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
61	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
62	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
63	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
64	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
65	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
66	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
67	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
68	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
69	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
70	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
71	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
72	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
73	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
74	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
75	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
76	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
77	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
78	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
79	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
80	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
81	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
82	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
83	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
84	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
85	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
86	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
87	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
88	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
89	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
90	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
91	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
92	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
93	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
94	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
95	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
96	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
97	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
98	410	567	37.71	0.12	303	430	47.5	1.10	21.11	10.79	62.40			
99	412	594	43.21	0.00	352	466	46.6	1.10	21.11	10.79	62.40			
100	410</													

will never absorb water when treated with steam at a temperature above 140° C. This proves:

"a. That the hydrates of faintly basic aluminates and silicates cannot be formed at this temperature, and that, consequently, they cannot exist except at temperatures below 140° C."

"b. That the strongly basic aluminates and silicates are not attacked by water at this temperature, since if they were decomposed, CaO would be liberated and an absorption of water would take place (because calcium hydroxide does not become hydrated in an atmosphere saturated with steam, except toward the temperature of 550° C.)"

Referring to the above statements and two others, not directly connected with the present matter, the author adds:

"These three phenomena have been confirmed by Mr. B. Blount to whom we communicated our observations."

When this was published the Pittsburgh branch of the Bureau of Standards was engaged in experimenting with the autoclave, and although the temperature obtained in its use was above that mentioned by Bied, it was thought advisable to repeat his work. When this was done, substantially the same results were obtained.

However, in the apparatus used, the hydration is carried on at atmospheric pressure, whereas in the autoclave the pressure recommended is 295 pounds per square inch. Consequently, the hydration of the dicalcium silicates (it is to be noted that there are four dicalcium silicates with distinct crystallographic properties) and the calcium aluminates were studied in the autoclave. These were placed in this apparatus so that they were subjected to the influence of the steam alone; that is, they were not placed in the water. In no case have the silicates or aluminates shown signs of hydration. If, however, these materials were allowed to hydrate in water, at room temperatures and atmospheric pressure, for several days, and then placed in the autoclave (subjected to steam action alone) it was noticed that the hydrated portion of the silicate was reduced to an amorphous powder, that the tricalcium aluminate, which normally hydrates almost entirely by absorption of water and crystallization with but slight decomposition into a lower aluminate, continues to hydrate with the formation of large crystals of the hydrated tricalcium aluminate; and that the $5\text{CaO} \cdot \text{Al}_2\text{O}_3$ aluminate and the monocalcium aluminate, which normally hydrate by the splitting off of hydrated aluminate and the crystallization of hydrated tricalcium aluminate resulting from their decomposition, also show the increased growth of the crystals of tricalcium aluminate and the changing of the apparently colloidal hydrated alumina from a translucent mass to a white amorphous powder.

It would appear, therefore, from the above that cements, if made from synthetic silicates and aluminates and placed in the steam in the autoclave after a short preliminary hydration, should show disintegration, as the apparently colloidal material is reduced to a pulverent powder and the crystalline material grows to excessive, frequently microscopic size.

The statements by the author of the paper under discussion in regard to the hydration of the dicalcium and tricalcium silicates are interesting. But the formation of the latter is dependent not only on the fineness of grinding and temperature of burning, but also on the composition of the raw mix. This may be such that there is little likelihood of the possibility of its formation. The four following cements, the analyses of which (in the nearest whole numbers)

	No. 8	No. 13	No. 20	No. 23
SiO_2	20.0	25.0	24.0	24.0
R_2O_3	12.0	12.0	15.0	9.0
CaO	67.0	62.0	60.0	66.0
MgO				

showed petrographically that No. 8 contained considerable tricalcium silicate, while No. 13 showed only a little; No. 20 showed none whatever, while No. 23 showed an amount equal to the dicalcium silicate present. An examination of the analyses would show that it would be absolutely impossible practically to burn 8 and 13 or 20 and 23 at the same temperature and obtain clinker. As a matter of interest, the autoclave test of the neat briquettes in tension and 1:3 two-inch sand cubes in compression showed:

Neat briquettes		Sand cubes	
Pounds per square inch		Pounds per square inch	
Normal	Auto	Normal	Auto
No. 18...453	335	875	1860
No. 13...152	159	210	1142
No. 20...168	129	554	1332
No. 23...218	511	380	1449

A comparison of these results brings up Doctor Cushman's statements in regard to the sand lime brick mortars. The closely comparable results in

compression and the widely variant results in tension of the autoclave specimens is very noticeable and taken in connection with the lime content of the cement, points towards the reaction of the lime set free during hydration with the silica of the sand.

The following results are given as bearing upon the statement in regard as to whether the autoclave test produces in a short period a normal hydration—is it an accelerated test in which the phenomena of hydration is identical with that which would take place under normal conditions? If such is the case, a specimen placed in water for a definite period and then in the autoclave, or placed in the autoclave at the end of 27 hours and then in water for the same period, should show a greater strength than one placed in water alone since there would be obtained the normal strength (hydration) plus the autoclave strength (hydration). The two following cements were tested (neat briquettes) at the following periods after the conditions of aging as shown:

	A				B			
Period at which tested	24	7	28	90:24	7	28	90	
Normal aging.....	115	437	636	738:363	639	683	690	
In autoclave at end of 24 hours and then in water until end of period shown.....	444	515	606	753:418	378	469	688	
In water until end of period shown and then in autoclave	444	406	788	814:416	473	503	468	

Cement "A" was a high silica cement which seldom gives 1:3 sand briquettes passing the seven-day requirement of the standard specifications. Cement "B" is a highly aluminous very low silica cement which gives high strength at seven days and but little gain afterwards. The results of the test of these two widely different cements as shown above, particularly at the end of 90 days, point very strongly to the fact that the hydration in the autoclave is abnormal.

(Discussion continued in ROCK PRODUCTS for August.)

J. B. Griffith, secretary-treasurer of the Edmonton Portland Cement Company, announces that the company's 1,500-barrel mill at Marlboro, Alta., began operations on June 1. The output for the first year has been sold to dealers in Edmonton.

Reorganization of the Altoona Portland Cement Co. has been effected, with a capital of \$1,200,000. The plant is at North Altoona, Kans. Incorporators are: Bert V. Howard, Kansas City, Mo.; T. A. Parker, Kansas City, Mo.; H. A. Butterfield, Kansas City, Mo.; G. B. Richardson, Altoona, Kans.; W. S. Willett, Altoona, Kans.; P. O. Nielson, North Altoona, Kans.

There is an old saying that "A prophet is not without honor save in his own country." This may be true of prophets, but it is not true of Trus-Con Stone-Tex, a liquid cement dampproof coating for stucco, concrete, brick and all forms of masonry exterior surfaces. The Trus-Con Laboratories, Detroit, Mich., this year furnished the materials for finishing the three largest hotels in Detroit—the Cadillac, Griswold and Tuller; the two largest department stores and one of the large theaters. It is evident that the merits of Trus-Con Stone-Tex are recognized in the city where it is made.

The International Association of Rotary Clubs will hold its next annual convention at Buffalo, N. Y., August 17-22. It is one of the social ideas of the present age that has made a great deal of enjoyment for many of its members and at the same time is a means for building up business acquaintances in a most favorable way. Fred J. Morse, of the St. Paul Lime & Cement Co., St. Paul, Minn., has been appointed chairman of the wholesale cement division of the Buffalo convention, and as there are quite a number of the most prominent cement men of the country connected with Rotary clubs, Mr. Morse is very anxious to call attention to the convention and get out a full representation of the cement interests, because Rotary clubs cover practically all lines of business endeavor and he wants his own special division to make the kind of showing that it ought to, as commensurate of the importance of the cement interests of the country at the present time. At the Kansas City cement show more than a year ago Richard L. Humphrey, president of the National Association of Cement Users, addressed the Rotary Club of Kansas City on the subject of cement, at which more than 200 of the leading business men of Kansas City were present to hear in this intimate way those things about cement which most people do not know.

A. & G. TO REORGANIZE.

Information from Philadelphia, Pa., is to the effect that the plan of reorganization for the Atlantic & Gulf Portland Cement Company formulated by the reorganization committee has been adopted by the holders of all deposited first mortgage bonds. The plan provides for the formation of a new company which will issue \$500,000 first mortgage 6 per cent thirty-year gold bonds, with privilege to issue \$100,000 additional for additions to plant. Special scrip bearing 6 per cent interest will be issued to all holders of first mortgage bonds of the old company participating in the plan. All scrip must be redeemed before the declaration of any dividends of the new company's stock of any class. There will also be issued \$1,500,000 7 per cent first preferred stock and \$200,000 non-cumulative 6 per cent second preferred stock, subject to redemption at option of the company.

RECEIVER FOR CEMENT PLANT.

During the first part of May Victor Beutner, manager of the Lumbermen's Cement & Brick Co., Carlisle, Kans., was appointed receiver for the property of that concern. The company is capitalized at \$800,000 and has been in operation about two years. It is alleged that the bonded obligations of the concern amount to \$350,000, on which the interest is in default. The petition for receivership was filed by R. V. Brown and two other creditors. Mr. Beutner recently stated that the engine equipment of the plant made further operation impossible and that a claim of \$235,000 is now pending in the Wisconsin courts. He is confident that a satisfactory adjustment will be found and the liabilities met in full. The company owes on open accounts about \$35,000, has on its books accounts receivable of some \$10,000, with unfilled orders for over 30,000 barrels of cement and large supplies on hand at the plant.

BIG CONTRACT FOR OLD DOMINION.

The Carolina Portland Cement Co., Charleston, S. C., closed a contract a few weeks ago for from 450,000 to 650,000 barrels of cement for the B. H. Hardaway Contracting Co., of Columbus, Ga. This vast amount will be employed in building dams, railroads and accessories for the Southern Aluminum Company, at the rate of about 25,000 barrels per month. It is believed that the maximum quantity will be used and the contract calls for the Carolina company's celebrated "Old Dominion" brand, which is made at Fordwick, Va.

CEMENT COMPANY INDICTED.

New indictments at Chicago, Ill., charging the Empire Portland Cement Company with having used the mails to defraud through a "blue sky" stock selling proposition were returned June 24 in Judge Landis' court by the federal grand jury. It is charged by the government that the concern was organized for the purpose of defrauding cement dealers throughout the country. Federal indictments returned a few weeks ago were found faulty.

The California Portland Cement Company, Colton, Cal., is putting in some new kilns.

A new cement mill is projected at Roseburg, Ore., by the Roseburg Commercial Club. D. W. Riedel, Portland, a large quarry owner, is interested in the plans.

Dillon-Boyle Waterproofing & Construction Company, Inc., waterproofing products, \$20,000; Edward J. Dillon, Charles J. Boyle, William G. Dillon, 1126 Park avenue, New York.

The supplies committee of the San Francisco supervisors has recommended that the contract be let to the Standard Portland Cement Company for cement to pave and repair streets for the ensuing year. The bid submitted is \$1.90 per barrel, 45 cents above last year's price. Several firms who submitted bids all made the same figure.

The Puget Sound Cement & Lime Company, recently incorporated at Seattle, Wash., with a capital of \$3,500,000, is headed by some of the leading contractors of Seattle, and proposes to establish a cement mill in that city with a capacity of 3,000 barrels. It is proposed to build a large quarry plant on Orcas island, where the raw material is situated.

CONCRETE

NATIONAL ASSOCIATION OF CEMENT USERS.

(Meets Annually.)

Officers.

President—Richard L. Humphrey, Philadelphia, Pa.
 Vice-President for two years—Arthur N. Talbot, Urbana, Ill.
 Vice-President for one year—L. C. Wason, Boston, Mass.
 Treasurer—H. C. Turner, New York, N. Y.
 Secretary—Edw. E. Krauss, Philadelphia, Pa.

TESTS OF NATURAL CONCRETE AGGREGATES*

BY RUSSELL S. GREENMAN.

In June, 1911, there was presented before this society by the writer a paper on "Practical Tests of Sand and Gravel Proposed for Use in Concrete." The object of that paper was to show the aid of certain laboratory and field tests in the selection of proper sands and gravels for general or special uses in concrete. The writer still stands by the deductions then made; but he wishes to show, under the head of "Tests of Natural Concrete Aggregates," that these tests do indicate the relative values of fine or coarse aggregates in actual concrete, and also to add a few suggestions that might help the engineer or contractor in the choice of his aggregates.

It is generally conceded that the relation of voids, loam and sizes of grains do have a bearing on the quality of the aggregates—the final essential quality of which is the ability to give strength. This strength of the materials has very generally been gaged by tensile tests, but it must be admitted that while these tests have been given comparable results, they have not given actual results but results merely indicative of what the material may do. It must be admitted, too, that it is almost impossible to get tests of the actual concrete. Various methods of securing satisfactory test pieces and unique ways of testing concrete in place have been suggested, but these have not, as a rule, been generally well received. The best plan to date seems to be to take samples of the concrete while being placed and mold them with as little work and as quickly as possible into small test pieces. These can be kept as near as possible in the same actual atmospheric conditions as is the concrete from which the samples were taken. At regular periods these test pieces can be tested for compressive strength.

That concrete test pieces so made give very little satisfaction in determining the qualities of concrete aggregates is quite a general opinion. Out of a large number of tests on concrete cubes made in general as stated, the author has endeavored to find out whether or not such is the actual case. Results of comparable tests were selected from series having similar characteristics; and after the results of the compression tests had been tabulated, the original laboratory tests of the aggregate were added to the

TABLE I.

Series No.	Proportions, Cement: Sand: Gravel.	Concrete Tests		Sand Tests			
		Number of Cubes	Compressive Strength at 28 days, lb. per sq. in.	Percentage of		Tensile Strength at 28 days, lb. per sq. in.	
				Run of Bank	Voids	Loam	Standard Sand
1.....	1:5:6	2	3465	40.7	26.7	4.6	343
		1	2611				272
		Av	3177				
2.....	1:0:	1	3113	36.2	28.4	3.5	394
		1	2631				343
		Av	2872				
3.....	1:5:7	1	3109				
		1	2605				
		Av	2857				

tabulation. This statement is given so that an impression may not be had that the examples selected were specially chosen but rather that they do indicate that the tests are correlative and corroborative.

* Paper read at the convention of the American Society for Testing Materials, Atlantic City, N. J., June 24-28.

In considering results of tests little reliance should be placed on a single test piece. In Table I there are given results of tests where the same brand of cement and the same gravel were used on each of three contracts by different contractors. Attention is called to the remarkable similarity of the average results secured and also to the fact that in each set of cubes the "low" block contained a "porous" bottom and gave practically the same results. There was a rather wide range between high and low "breaks"—explained by the porous bottom—and well illustrates the folly of basing conclusions on one test piece only. The gravel being used was the "run of the bank" and necessitated frequent field tests for characteristics to determine the proportions to be used. As a rule these proportions were 1 part cement to 5.6 parts gravel to replace the 2.5 parts sand and 5 parts gravel required by the contracts.

In Table II another comparison will indicate results corroborating laboratory tests for relative values of sands. A different brand of cement from that in Table I was used, but the same brand was used for the three different series. Crushed stone from one quarry was also used for the coarse aggregate on all three contracts. The sands were from different banks, although series Nos. 4 and 6 were similar sands taken from adjoining banks; No. 5 was taken from a bank which has a characteristic quality peculiarly its own.

Since the variable material here must be in the sand a study of the results readily shows that the

TABLE II.

Series No.	Proportions, Cement: Sand: Stone.	Number of Cubes	Average Compressive Strength, lb. per sq. in.	Sand Tests			
				Percentage of		Tensile Strength at 28 days, lb. per sq. in.	
				Voids	Loam	Natural Sand	Standard Sand
4.....	1:5:4	3	2577	35.3	1.2	301	322
5.....	1:2.5:5	3	1755	26.9	4.2	305	295
6.....	1:2.5:5	3	2651				

tests do give corroborative results and that they should aid in the making a choice of the sand to be used. An explanation should be given to the fact that here a richer concrete gave a lower result than did a leaner one. The richer concrete was for reinforced concrete and the test pieces plainly indicated that the concrete when placed was a rather wet concrete and would, of course, produce in the relatively early test a lower strength. The point is thus emphasized that it would be folly to accept any result of the test without noticing every characteristic of the test piece—in other words, judgment as to the value of the material must be based upon careful tests, study and common sense perception.

As a further illustration of the need of perception in drawing conclusions, the results of compressive tests made on four cubes of concrete received from one contract are given in Table III. All were made

TABLE III.

Series No.	Cube No.	Compressive Strength at 28 days, lb. per sq. in.	Cube No.	Compressive Strength at 28 days.
7.....	1	2263	2	1944
	4	2288	3	1989
	Average	2276	Average	1967

at the same time and from the same materials in the proportions of 1 part cement, 2 parts sand and 4 parts local gravel, washed and screened.

It will be noticed that there is a fairly close "break" in the four blocks, but why not still better. An examination of the crushed blocks clearly showed that Nos. 2 and 3 contained a larger number of soft sandstone pebbles. It had been noticed in the examination of the gravel before its use that one of the objectionable features was the presence of soft sandstone pebbles. The test not only confirmed the judgment that they were a point of weakness in the gravel, but directly pointed out the fact and did not leave it a matter of personal opinion.

And again along the same line of argument. A study of Table IV(a) will show that specifications calling for definite proportions of materials do not necessarily provide for the best concrete by simply asking for richer proportions. In other words, a 1:2:4 mixture may not produce as good concrete as a 1:2.5:5 mixture. Cubes apparently mixed with equal care and from the same materials, but in different proportions, were submitted for tests.

The richest mixture here gave slightly lower results than the next leaner. Reasoning as before, it might be said that it was because the consistency was different. This may be true; but an examination of the test piece showed no great difference in this particular. A comparison of the proportions and resulting strengths will show, however, that the leanest

TABLE IVa.

Series No.	Proportions, Cement: Sand: Gravel.	Concrete Tests	
		Number of Cubes	Average Compressive Strength at 28 days, lb. per sq. in.
8.....	1:2:4	3	1514
9.....	1:2.5:5	3	1593
10.....	1:3.5:7	3	1234

TABLE IVb.

11.....	1:2:4 (Gravel) ¹	3	2326
12.....	1:2:4 (Stone)	3	2473

¹ Washed and screened.

mixture gave in proportion of aggregates to cement the relatively best result. Then would it not be fair to assume that the characteristics of the sand and gravel as to voids, grading, etc., had a decided effect upon the results of the tests and that there is a relative proportioning that will give to the concrete the greatest strength the cement might be capable of producing?

Examination of Table IV(b) will show that a little extra attention given to a material may result in a far better product. In Series No. 11 the gravel was washed and screened with a very decided improvement in the material. The relative value of the gravel and crushed limestone is slightly in favor of the stone, in so far as the compressive strength is concerned.

In another work the relative value of different sands and gravels and crushed stone was determined from a long series of tests. Some typical results were selected and are given in Table V.

A further study of these results will show that the claims made previously in this paper are true, that there is a distinct relation between the effect of the aggregates in actual concrete and the tests made in the laboratory. In these series the same cement was used in all tests. The gravel in the bank run was deducted from the stone used; the proportions used were 1 part cement, 2.5 parts sand and 5 parts combined stone and gravel, except in Series No. 15, where only screened gravel was used. Series Nos 14 and 15 were made with a sand slightly inferior to No. 13, but had less of the gravel element. Series No. 16 had the larger stone element but was made of a relatively much poorer sand.

In considering the relative value of the aggregates under inspection one cannot overlook the fact that concrete made from different cements will produce different strengths with any one aggregate; but it must be remembered that, in considering the results of the tests, due allowance must be made for the relative early strengthening qualities of the cement being used. Hence to expect or to specify that all concrete shall give a crushing strength of any given number of pounds would not mean that the aggregates would be specially good, but rather that the cement might have a high initial strength which may or may not be beneficial, depending on the view point. So in drawing conclusions from results of tests of concrete, one must keep in mind the "strength characteristics" of the cement used.

It had been the original intention of the writer to discuss minutely the methods of making field tests of natural concrete aggregates and to show the bearing each test has on the selection of the best aggregate. But the feeling that it might be considered discourteous to fellow members of a committee which is making a study of methods, it was decided to treat the subject with the main object of trying to show to the skeptical mind that both the laboratory tests and carefully made field tests and inspections do present ways and means of indicating what the natural aggregate, either fine or coarse, will actually do in the concrete in place. That is, with the same methods of making concrete and under the same or similar conditions the relative value of the materials is clearly indicated. It must, of course, be thoroughly understood that a separate test without a consideration of all the phases and conditions cannot be an infallible guide; but each test made is one more aid to the selection of the aggregate best suited for the purpose intended.

TABLE V.

Series No.	Sand Bank	Coarse Aggregate	Number of Cubes	Compressive Strength at 28 days, lb. per sq. in.	Percentage of				Tensile Strength at 28 days, lb. per sq. in.	
					Run of Bank	Voids	Loam	Bank Sand	Standard Sand	
13.....	A	Gravel and sand	3	2068	30.9	27.5	3.3	284	278	
14.....	B	Gravel and sand	3	2298	35.2	31.5	7.9	280	314	
15.....	C	Screened gravel	3	1954	25.2	31.5	7.9	280	314	
16.....	C	Gravel and stone	6	1450	75.3	32.5	0.6	188	281	

¹ Washed sand.

NOVEL CONCRETE LIGHT POSTS.

By Horatio F. Stoll.

One of the novel sights in Riverside, the heart of the citrus belt of southern California, is the artistic concrete light posts that ornament the business and residence sections.

A few years ago, F. A. Miller, whose Mission Inn is the big attraction of the city of Riverside, instructed his architect, Arthur Burnett Benton, to make a sketch of a three-light post which would be permanent in character and carry out the mission atmosphere that prevails in all the leading buildings of the city. For the top he used a triangular design, which serves as an excellent support from which to hang the globes that resemble mission bells. It is copyrighted by Mr. Miller and employed as a trademark on the inn's literature, letter heads, etc., but Mr. Miller expressed his willingness to allow the city to use it.

From this sketch the Ornamental Cement Company worked out the details and made a concrete post which was set up near the public library for exhibition. So much was the model admired that it was decided to adopt it for general use, and accordingly hundreds of them were set on concrete foundations along the leading business streets by A. P. Campbell, the city engineer.

The blocks of Riverside average about 330 feet square, and in order that the lights might be properly distributed Mr. Campbell worked out a plan by which they were set in pairs 82½ feet apart with eight posts to a street intersection. The posts cost \$32 each and the wiring \$8, making the total expense \$40. To cover this amount the property owners were assessed at the rate of about \$1 per front foot. This included their installation. The city furnished the electricity and maintenance. The lights used are two 60-watt Tungsten and one 40-watt Tungsten.

The specifications of the core of the posts call for one part Portland cement, two parts sand, clean sand that will pass through ¼-mesh sieve, and two parts of hard, durable rock, broken to pass through a ¾-inch sieve and to be rejected by a ¼-inch mesh. The plaster coat consists of one part cement, one part fine sand and float finished.

The residence streets of Riverside are well shaded with trees and, as it was found that these 17-foot mission lamps would go up into the trees and hide, it was decided to adopt a distinct one-light lamp post for the residence blocks, which are also 330-feet square.

The Ornamental Cement Company made the design themselves and, as will be seen by the blue

print, the posts are 11 feet 6 inches high and are staggered on either side of the street 110 feet apart. They cost \$12.50 each and, with the wiring, total \$17, making it necessary to assess the property owners per front foot from 45 to 50 cents each. One 60-watt Tungsten light is ample. The material used is the same composition as the mission posts—that is, one part Portland cement, two parts sand and two parts rock, with a coat of one part cement, one part fine sand and float finished.

These lamp posts are refined in appearance and their soft gray color contrasts nicely with the verdure of the trees and gardens that make Riverside one of the most beautiful cities in California. They are sprinkled for miles along Magnolia avenue, a superb stretch of durable roadway, ornamented with the slender eucalyptus, the spreading palm, the drooping pepper, and the graceful magnolia, and set off with a bewildering profusion of flowers. At night, when the avenue is illuminated, the scene is indescribably beautiful.

Along the business streets, the higher mission lamps also show off to great advantage, for no huge, glittering signs are permitted to extend over the heads of pedestrians or crown the tops of buildings. As a result, the three-light posts are not subordinated. They stand out prominently and give a uniform light throughout the business district.

CONCRETE TILE ADOPTED IN CANAL ZONE.

The Panama Canal Commission has arranged with the Concrete Stone & Sand Co., of Youngstown, Ohio, and A. A. Pauly, inventor and patentee of the Pauly concrete hollow tile machinery, for an extensive plant to be operated in the canal zone for the purpose of manufacturing hollow tile for the construction of all of the permanent buildings in the new city of Balboa, which is being built by the government to take the place of the older Spanish towns which are being removed by the operations of the canal commission. As the canal approaches completion the importance and necessity for building permanent, sanitary and fireproof homes, offices and every other kind of structure becomes paramount, as the control of health conditions in the canal zone is the most important feature for its permanent success and benefit to mankind.

No other building material has ever been produced which covers all of the points needed to compare with the concrete hollow tile made by the Pauly process. Besides all of these necessary qualifications the tile is very cheap and it is actually true that buildings in many parts of the country where the Pauly tile is offered in the market are being built fireproof, sanitary and permanent in every way at figures which are parallel with ordinary economical house construction.

This achievement of cement industry of having the best engineering intelligence with the approval of the medical board to select a cement product for this important requirement is the best demonstration of the quality of the material, which would be cheap at any price. But as a market commodity it has taken its place not only as the best obtainable but as the cheapest as well. Several hundred houses in and around Chicago, an equal number in the neighborhood of New York City and in many other parts of the country are witnesses to the wisdom of the selection of this material, which has been chosen by the government engineers and the medical men as the best to use in a place like the canal zone, which has been one of the problems of mankind for nearly half a millennium.

REPAIR OF CONCRETE WALL SURFACES.

A rather unique method of repairing a concrete wall surface damaged by freezing before setting, was successfully used in the case of a retaining wall on the Pennsylvania Railroad at South Fork, Pa. The patch has now stood over 15 months, and is apparently in as good condition as when placed. The faulty concrete was removed by a small hand pick to depths varying from 1 to 18 inches. The sound concrete exposed was carefully cleaned; steel dowels were driven into it at 6-inch intervals, and a light reinforcing mesh attached to the dowels. Forms were then placed for the face of the wall, the concrete thoroughly wetted, and the holes filled with a 1:2 mortar.

TO MOVE CONCRETE BUILDING.

The San Francisco house-moving firm of Nichols & Handley, which is just completing the removal of a large Class A high-school building to a new site, has taken a contract to remove a 4-story concrete building on Folsom street near Fifth, belonging to Geo. E. Bates. The building will be raised and moved to the adjoining lot, a pile sub-foundation will be driven on the original location, and the building brought back and placed on the new foundation. The price for the job is \$20,000. Smith, Emery & Co. are the inspecting engineers.

KAHN SYSTEM STANDARDS.

Hand-book on Reinforced Concrete.

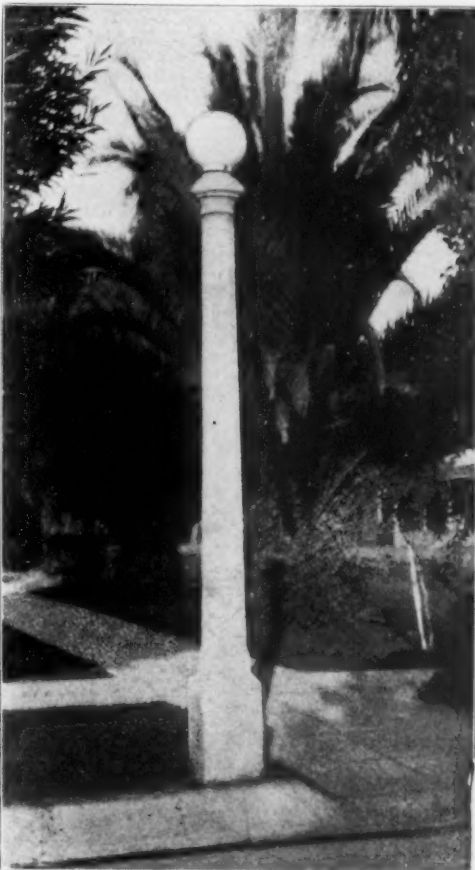
The fifth edition of "Kahn System Standards," issued by the Trussed Concrete Steel Co., Detroit, Mich., is being distributed by that concern. This new edition contains numerous additions and revisions over previous issues. The "Kahn System Standards" is generally recognized among engineers, architects and builders as a standard hand-book on reinforced concrete. It is used as an auxiliary text-book in many of the leading technical universities.

The new edition contains the following new features, which appear for the first time: Photographic views of various types of reinforced concrete structures; interior views of various types of reinforced concrete floor construction; complete specifications for reinforced concrete; illustrated discussion of the advantages of reinforced concrete construction; tables of comparative cost of reinforced concrete; wood mill construction and structural steel; floredome and floretyle construction; many new tables, including those for beams, and also a complete revision of the text matter.

"Kahn System Standards" is divided into sections covering completely the following matter: Advantages of rigid connection of shear members; properties of Kahn building products; advantages of reinforced concrete construction; specifications for reinforced concrete; theory of reinforced concrete; typical installations; illustrations of various floor constructions; complete tables covering solid concrete slabs, reinforced with Kahn trussed bars, rib metal and Hy-Rib; tables for floredomes, Floretyles and terra cotta tile floors; tables for reinforced concrete beams, square columns and hooped columns; tables for reinforced concrete footing, and materials in concrete and mortar and estimating table.

"Kahn System Standards" is issued primarily for practising architects, engineers and contractors, to whom it is distributed free. To others a nominal charge of 50 cents per copy is made. No doubt many of our readers will be interested in this new edition, and it is found to be in great demand.

Oklahoma Concrete Silo Company, Oklahoma City, Okla., capital stock \$5,000; incorporated by S. H. Ingham, E. W. Linzee and C. A. Henderson.



ONE LIGHT CONCRETE POST, RIVERSIDE, CAL.



THREE-LIGHT CONCRETE POST, RIVERSIDE, CAL.

NUMEROUS CONVENTIONS DURING CEMENT SHOW.

The Chicago Cement Show in February, 1914, will be featured by the conventions of a number of organizations to be held in conjunction with the exhibition.

The plans of the National Association of Cement Users, which will convene in the Auditorium hotel, February 16-20, have already been announced by President Humphrey.

Secretary E. S. Hanson, of the Interstate Cement Tile Manufacturers' Association, is completing arrangements for holding the convention of that organization in Chicago, February 17, 18 and 19, 1914.

The National Association of Sand & Gravel Producers, through President F. W. Renwick and the executive committee, have expressed their intention of holding their next annual convention during the period of the Chicago Cement Show. Detailed arrangements for the convention are progressing.

According to announcements made by Secretary George Wilson-Jones, of the Illinois Lumber & Builders' Supply Dealers' Association, and C. E. Mateer, executive secretary of the Illinois Association of Municipal Contractors, the conventions of both of these associations will be held in Chicago on dates to be selected falling between February 12 and 21, 1914.

Several other organizations are considering the advisability of convening in Chicago during the national Cement Show.

The advantages of holding joint meetings in this way are many. Builders, dealers, engineers, contractors and cement products manufacturers are able to attend the conventions and inspect the exhibits by making but one trip to Chicago. Exhibitors and their salesmen are enabled to make a display which will reach the membership of all the associations.

The seventh Chicago Cement Show promises to eclipse all the exhibitions of the past. Exhibition space is being reserved rapidly and a wider range of noteworthy and substantial exhibits are in prospect. The recent development of concrete road construction has led a number of manufacturers of concrete road building equipment to make application for spaces. It is expected that there will be an extensive representation of manufacturers of road machinery and large concrete mixers and concrete handling apparatus.

FIRST DRAWING OF CHICAGO CEMENT SHOW SPACES.

July 29 marks the first drawing for space at the Seventh Chicago Cement Show. Applications must be on file in the office of the Cement Products Exhibition Company, 72 West Adams street, Chicago, not later than noon of July 22.

One show held during the winter at Chicago is ideal from the standpoint of exhibitors and visitors. Chicago is accessible from all points. It is in the center of a territory noted for its activity in concrete construction. The time chosen—February 12 to 21—is opportune, the time when contractors, engineers, manufacturers and cement dealers are about to purchase equipment. One of the most sweeping changes planned this year is the omission of partitions, which will afford the visitor a better opportunity of studying the exhibits, and with the new space numbering system, exhibits may easily be located.

In consideration of the number of conventions meeting during the period of the Cement Show, the time of the show has been increased by two days.

The Cummings Structural Concrete Company has removed to new offices in the Machesney building, Pittsburgh, Pa.

At a recent meeting of the National Fire Protective Association, Richard L. Humphrey secured for cement products the first place as fire resisting mediums in the construction of fire-proof buildings.



In his capacity as president of the National Association of Cement Users Mr. Humphrey has long been considered as the leading mouthpiece of the entire cement industry in matters technical and structural for the higher uses of cement. From the first introduction of cement products in the market Mr. Humphrey has been in the forefront securing for them the position which their merits entitle them to, and he is an advocate of concrete hollow tiles for the protection of steel, for the construction of floor arches, for building certain walls, and for every other similar purpose where fire-resisting qualifications are the requirement. Having demonstrated in his own experiments, examinations and observations the unquestioned superiority of the concrete goods, Mr. Humphrey does not hesitate to advocate their use and to insist upon securing their recognition with the governing boards of the Fire Protective association in the building codes and wherever such technical knowledge can be made useful. In this Mr. Humphrey is fulfilling a great and useful mission for the entire cement industry and his work



INTERIOR VIEW OF PIEDMONT COURT, SHOWING CEILING DECORATION.

as a consulting engineer and his eminence in this country is well won and well sustained by his constant study and application to this greatest subject in structural matters of the present day.

PIEDMONT COURT.

Built upon an eligible site on High street, which is in the most select residence district of Santa Cruz, Cal., the handsome structure illustrated on this page is considered the most up-to-date apartment hotel on the Pacific Coast. Designed by William Bray, an architect of international reputation, who also superintended every detail of its construction, Piedmont Court embodies in addition to its beauty of outline all the most approved structural features, making for safety, convenience and sanitation.

The building material used throughout is reinforced concrete; the column and beam method of construction is followed with extra heavy curtain walls. The partition walls separating the rooms are also of reinforced concrete. The building covers an area of 120x136 feet. It contains two stories and a basement, and is designed and constructed for two additional stories.

The roof, which commands a magnificent view of Santa Cruz and Monterey Bay, is arranged as a roof garden and is provided with a grill, so that guests may have meals served there if they so desire.

The building is of Moorish design, as may be seen from the accompanying picture, and contains a spacious inner court or patio fitted with an electric fountain.

The sleeping rooms are equipped with Marshall & Sterns Portal oscillating beds, and one of Copeman's electric fireless cookers is installed in each apartment. The building has its own electric generating plant, steam heat, vacuum cleaner and intercommunicating telephone system of the very latest pattern.

All of the cantilever brackets, columns and mural enrichments are of monolithic construction and cast in situ.

A noticeable feature of the building is the absence of expansion cracks in any portion of it.

The Mount Diablo brand of cement, manufactured by the Henry Cowell Lime & Cement Company, was used in the construction of the building, and clean river gravel was used in making the aggregate. The architect virtually remained on the job night and day while the concrete was being mixed and poured.

The entire structure weighs 151,000,000 pounds and contains 10 miles of plumbing and steam pipes; four miles of electric conduit; eight miles of duplex wire; 65 tons of re-enforcing bars; 75,000 square feet of electric welded fabric. The work of construction was completed in six months.

REINFORCED CONCRETE WALL AND COLUMN FOOTINGS.

"Reinforced Concrete Wall Footings and Column Footings," by Arthur N. Talbot, has just been issued as Bulletin No. 67 of the Engineering Experiment Station of the University of Illinois. The load on a building or other structure is transmitted to the earth through the footings under the walls and columns. Uncertainties exist in regard to the strength of footings and to the magnitude and distribution of the stresses. This bulletin gives the results of an important and extensive series of tests, in which footings were loaded in such a way as to approximate the conditions to be expected in structures. A discussion is given of the various factors which must be considered in designing footings and of the formulas which may be used. The tests indicate that certain elements of design have not always been given the proper consideration. This is the first set of tests of the kind known to have been made. Copies of Bulletin No. 67 may be obtained upon application to W. F. M. Goss, director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

R. L. Wilson, cement contractor, of Reading, Pa., recently sold the ground on which his plant was located and purchased a new site at Third and Greenwich streets, and is moving to that location.

The Scientific Concrete Pile Bulkhead Company, of New York, was recently incorporated under the laws of Delaware, with a capital of \$50,000, F. F. Pannaman, of New York, being the principal incorporator.

The Building Commission of Philadelphia recently held a meeting to discuss the use of concrete in footings and foundations of houses and other buildings, and decided to permit the Master Builders' Association, of this city, to use concrete, with stone and gravel as aggregates, for this purpose.

Homer Manville, president of the Kalamazoo Silo Company, was in Brazil, Ind., is looking for a location for a plant to manufacture silos. Mr. Manville stated that he will purchase a site in the near future for the proposed plant. The company will manufacture concrete staves and clay silos.

M. R. Feret, head of the Laboratoire des Ponts et Chaussées, Boulogne-sur-Mer, France, in his book on reinforced concrete, states that the drier mortar is made and the more it is tamped, the higher is its resistance, other things being equal, and on the other hand its bond to metal increases with the amount of water used in the mixture.

The history and proceedings of the eighth annual convention of the Nebraska Cement Users' Association has been printed and issued by that organization. The work covers in full the papers which were read and discussion which took place during the association's convention in Omaha, Neb., February 5, 6 and 7, 1913. Portraits of the officers and directors are also contained in the book. The association is making elaborate efforts to make the next meeting in Omaha, January 30 to February 4, 1914, to be known as the Eighth Mid-West Cement Show and the Ninth Annual Convention of the Nebraska Cement Users' Association, of even greater magnitude than any yet held by the association. Frank Whipperman, 28th avenue and Sahler street, Omaha, Neb., is secretary-treasurer of the organization.



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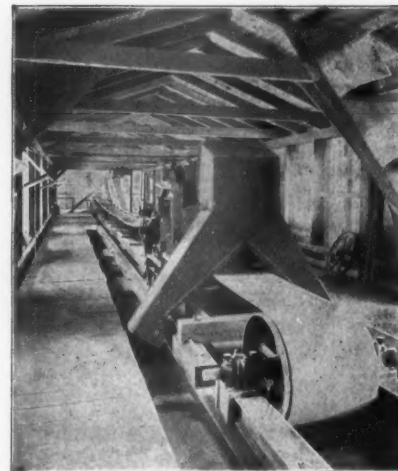
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FINE CHICAGO APARTMENT HOUSE.

An article in the June number of ROCK PRODUCTS calling attention to concrete hollow tile of the Pauly type of construction for inexpensive garages, brought to this paper so many inquiries regarding this material that the paper's representative called on the Chicago Structural Tile Company for still further information regarding the product about which there seems to be so much discussion.

The manager of the Chicago Structural Tile Company, who was so enthusiastic at the last Cement Show, took great pleasure in giving the representative some information, together with two photographs



HAEDTLAR TWO APARTMENT HOUSE.

showing one of the latest houses that has been constructed of their material.

The first picture shows a house that has just been completed on Star avenue, Woodlawn, between 64th and 65th streets, and was built by Sergeant W. A. Haedtlar, of the Woodlawn police station. The second picture shows the garage that was built in rear of his house large enough for four automobiles.

The Pauly tile required for this house and garage amounted to less than 10% of the total cost of the two buildings. Sergeant Haedtlar looked long and hard for a material possessing the qualities that he required before he finally decided in favor of Concrete Hollow Tile. He wanted a fireproof material, a waterproof material, and at the same time not too expensive a material, and he got what he wanted. He got what eminent concrete experts had said would keep his basement free from moisture and this tile has done so.

Pauly tile was used in the following parts of the house:

- 1—The entire foundation below grade, which tiles were filled with concrete.
- 2—Foundations of all area walls.
- 3—Walls of entire house.
- 4—Window sills.
- 5—Porch columns.
- 6—Porch walls.
- 7—Porch floors.
- 8—Porch Copings.
- 9—Belt course.
- 10—Window and door lintels.
- 11—Chimney.

The foundation is 12" thick, and the only protection against moisture lies in the density of the tile, as no waterproof compounds were found to be necessary. The inside of the foundation walls received the ordinary coat of plaster that is always applied to all high class houses. The foundation of the area walls are made of 8" tile. The walls of the first story are 12" thick and the second story walls are 10" thick. The plaster was applied to the inside of the walls direct, without any furring or lathing, consequently this expense was saved. The window sills of every window are made of 4" tile filled with concrete, and with the plaster covering no joints are to be seen. The porch columns which hold the second story porch are made of tile filled with concrete. The coping on the porch rail is made of 4" tile. The porch floor is made of 4" tile in the regular manner of tile and beam construction, and the whole floor is covered with concrete. The lintels over the doors and windows are made of tile, through which steel reinforcement has been placed. The chimney is made of tile filled with concrete. The entire house is covered with stucco.

As a result of using Pauly tile in his house and garage, Sergeant Haedtlar has been able to put the money saved thereby into that part of his house which is most interesting to his tenant, namely, the inside. At the same time he is guaranteeing his tenant a house that is dry, and warm in winter and cool in summer. He has been able to beautify his interior in a manner that would have been impossible

had he not been able to economize by the use of Pauly tile. He seems well pleased with his investment and is occupying the lower apartment himself. Sergeant Haedtlar is a man of charming personality and has done much to beautify the grounds around his house, and seems to take pleasure in showing his house to those who are interested.

This is a splendid example of the fact that the cost of the tile in a house is only a very small part of the total cost of the house. The Chicago Structural Tile Company is always glad to go into the details of this method of construction, and as the tile is becoming well known, and as the contractors are becoming familiar with the method of handling, the cost of construction is getting lower and lower, and it begins to look as if the time has come when people can actually build homes for a sum within their means.

FLOOD PREVENTION REQUIRES PROMPT AND SCIENTIFIC HANDLING.

The telegraph news reports are again reciting the flood disasters in the minor rivers of Ohio, particularly those which only a few months ago were the subject of the record of a devastating flood. Many of the temporary bridges that were put in so as to provide for railroad traffic and for highways as well have been washed away, and in some instances repetitions of the early spring disasters have occurred. Now this condition—for it is a condition and not an accident—requires immediate, prompt and efficient action. There is a time-honored expression that "lightning never strikes twice in the same place," so the deduction naturally follows that the best place for a person to be safe from lightning would be to occupy the spot where the lightning has just struck, and so be immune.

But this is not the case with the rivers in question. There is just two horns to the dilemma—one is for the cities and towns to go away from the rivers or the rivers to go away from the cities and towns; the other, if the rivers have to stay, attend to them as they should be attended to. The farmers of the upper water shed have just exactly the same right, and no more, to provide artificial means for throwing their surplus water from their farms into the water courses as the cities and towns to throw the surplus water from the streams and from the sewerage systems into those same rivers.

Fifty years ago when those cities and towns located on the feed rivers of the upper Mississippi water shed were being built, the pollution of streams by the introduction of sewage was considered to be a sanitary necessity and it has been universally practiced in all parts of this country, until today practically every river that runs through the populous state is polluted with sewage to the last degree of defilement.

Only recently the farmers have learned by the development of tiling systems to drain the surplus water from farm lands so as to throw such water into the same rivers, and the consequence is that even with an ordinary rainfall the rivers are swollen out of their banks and trouble occurs, and it will keep on occurring and not only wipe out the total increase of wealth in those sections of the country, but will pauperize the population in a very short space of time.

One trouble is the condition of the rivers themselves. The owners of riparian lands are notoriously guilty of encroaching upon the streams to such an extent that the streams themselves are confined to less than one-fifth of their natural and legal boundaries in many places. The river fronts in many places are considered to be public dumping grounds, especially in towns where the conformation of the banks are such as to provide a swiftly running stream which carries the garbage and other offal that falls into the stream out of sight; but that same stream which flows swiftly by one town broadens out a few miles below and becomes a sluggish shallow water course with bars that collect the tin cans and the heavy solids, which so accumulate as the years go by as to raise the bed of the streams and so form partial dams which impede the flow of the current and add to the danger of floods which the sudden over-supply of water gives the first impetus.

The restoration of the banks of the rivers to a legal margin, the dredging of those rivers to their natural beds, the control of the drainage system in the farms so as to hold the water back and the abandonment of the sewage systems which dispose of the surplus street washings through the sewers as flush water, have all got to be changed promptly and upon a scientific basis. In the light of modern knowledge there is absolutely no reason or excuse for any city, town or village to use an adjacent river as a mammoth open sewer. It is probable that a modern scientific sewage disposal system can be so installed as to yield a profit that will pay all of, or at least a large part of the interest on the investment of the sewerage plant of any city, town or village, by the scientific use of the sewage material.

In a state which produces such a large portion of lime products of the entire country as Ohio, there is still less excuse for any city, town or village not to have a sewerage disposal equipment which is up-to-date, profitable and sanitary. No one can consider in this day and age that a sewerage system which terminates into an adjacent river is anything less uncouth than the first fig leaves of civilization. It is like going out to a twentieth century battle with the flintlock muskets of the army of Frederick the Great.

When one considers that even the great city of Chicago is at the present time supporting a so-called sanitary board for the purpose of operating an open sewer through the Chicago river to the Desplaines river, thereby polluting all other streams between Lake Michigan and the Mississippi river, when that same sewage could be scientifically disposed of upon a small investment and pay the city big returns in the shape of products of the sewage disposal plant, it is astounding that such things can be perpetrated; and the only hope on the horizon is that when the vote of the women is counted in the determination of such matters their practical sense will make a better showing than the men have ever been able to do. And right here it is meet and proper to say that the practical housewife sense of the average woman has got the average American business man beat like sugar beats sand when it comes to settling economic questions of just this particular kind.

If these cities and towns along these oft-flooded rivers would attend to their sewage disposal plants; if the rivers are dredged to their natural beds; if the farmer is made to provide temporary retention pools for his surplus water in flood season and the greedy riparian land owner is made to stay back to the line of demarkation, the probability is that those rivers will behave themselves just like they have done for all the centuries while nature has been performing her work in her natural way, and those rivers will neither rise so high in flood time nor fall so low in drouth time as they have been doing in the last few decades when every village board, every township trustee and every riparian land owner has been doing his little river front abuses that in the aggregate go to make up the big defects which the monster streams at flood times have their battles with and which make the trouble, the cost and the expense that is always charged up to human labor and human effort to build over again and to pay over again for the some convenience, the same bridges, the same roads and the same improvements that were paid for by our forefathers generations ago.

Why wouldn't it be a good plan for some of the heavy financiers to get busy with a large company whose principal business would be to construct scientific sewage disposal plants for cities, towns and villages throughout the length and breadth of



HAEDTLAR FOUR MACHINE GARAGE.

this land, so that the sanitary as well as the flood conditions of our rivers may be improved and the streams be restored to food-producing assets throughout the country which they flow by means of the schools of live fish that can be propagated therein if the fumes derived from sewage was not present in those streams. It is a part of the waste which adds to the whole that goes to pile up the high cost of living or the cost of high living, whichever way the words are arranged.

N. R. France and family were spending a few days at the Breakers at Cedar Point last week. He says all his big crushers are going and looks as fine as a fiddler for a man who was on the sick list a year ago.

The new sand crushing department of the Hancock Stone Co., at Findlay, O., was destroyed by fire recently. The origin of the fire cannot be explained by the watchman. The damage will be restored as soon as possible.

M. P. Goetschius, of Lima, Ohio, has been resting with his family at the Breakers at Cedar Point. He says that his new plant at Ottawa is just about complete and running steadily upon orders for crushed rock that just come along like a military procession.

OHIO DEALERS' OUTING AT CEDAR POINT

The Eight Annual Summer Meeting of the Ohio Builders' Supply Association Resembled an Old Settlers' Picnic, Affiliated with the National Builders' Supply Association, Talked Shop and Had a Good Time in the Breakers.

The dealers in building materials of the State of Ohio, their wives and children, and the representatives of the manufacturing interests who cater to the building trade, met at the Breakers Hotel, Cedar Point, July 24-25-26, for the regular summer-meeting of the Ohio association. As usual it was a very enjoyable affair. Some of the attendants at the meeting only registered and let the sea breezes of Lake Erie blow them into a good humor during the first day, and a few came down on Sunday night so as to make a whole week of the outing.

The registered attendance shows quite a goodly number of the representative people in the business in Ohio, and as usual there were quite a few derelicts who failed to register and wear a badge and just joined in the good time and listened to the progressive "dope" of the meetings, without getting into the game officially.

There was an executive meeting, at which all of the officers of the association assembled for a brief period to discuss the work before the convention, but who they intended to execute has not been vouchsafed, and from the good humor which they all were in when they came from the conference we judge that the worst resolutions that were passed consisted of the list of those who should be ducked next morning in the waves.

On Friday noon there was a delightful little banquet served in the main banquet hall, at which 125 covers were laid, and it was a first-class fish dinner.

President Arnold allowed the ladies and visitors to depart, retaining the association members in their seats to smoke cigars while the Honorable Henry A. Conlin, secretary of the Ohio Lumbermen's Credit Association, gave a practical talk upon the subject of "How to Use the New Lien Law." Mr. Conlin is the man who made the law and is responsible for its existence more than any other one individual, and he took up the new law which goes into effect August 5 section by section and explained the application and bearing of each, so that every one present could thoroughly understand the new instrument which will govern collections and the safety of accounts when applied to future building operations in the State of Ohio.

After reading each section and explaining its application, Mr. Conlin invited discussion and questions so that by this method every man could work the matter out so as to fit his own individual case. The discussion consumed more than two hours and was extremely interesting to all of those who took part in the same on account of its bearing upon the main feature of the building supply business—the getting of the money. At the close of his lecture—for the discourse

may be well dignified by such a name—a rising vote of thanks was tendered to Mr. Conlin by the dealers assembled there.

President Arnold next introduced E. S. Walton, of Youngstown, Ohio, the president of the National Builders' Supply Association, prefacing his introduction by stating that Mr. Walton, W. W. Cooney and J. C. Adams, as a committee of the National Association, had conferred with the executive committee of the Ohio Builders' Supply Association with a proposal for the Ohio association to affiliate with and become a part of the National Association for the good of all concerned, and that the executive committee of the Ohio association had voted to recommend the affiliation or joining of the National Association.

Mr. Walton stated that the proposition of the National Association consisted of an invitation for the Ohio Builders' Supply Association to affiliate with the National upon a representative basis, each member of the Ohio association paying into the fund for affiliation the sum of \$2 and for every five members of the Ohio association one delegate with full powers to vote in the National Association to be elected. Mr. Walton explained that this same proposition has been presented to various other state organizations, and the proposition has been favorably received, and he had little doubt that as soon as the Ohio association had shown the path by which national co-operation could be made possible and practical and still preserve the identity of the state association for the administration of local affairs, that all of the other state organizations would follow, and by this means erect a highly dignified and important co-operative body to work in conjunction with the producers and manufacturers of materials which are used by the supply dealers. Mr. Walton, as president of the National Association and being an Ohio man, felt that the association of his own state was the one which he would prefer first to see come out on the line in this new progressive movement.

There were a few questions put to Mr. Walton in order that the members might better understand the proposition, and then on motion of Mr. Fay, seconded by Mr. Schaeffer, the proposition was unanimously carried and the affiliation of the Ohio Builders' Supply Association with the National Builders' Supply Association became an established fact.

After a little discussion on the subject of co-operation in its broadest sense, the meeting adjourned, and nearly everybody went into the lake.

On Saturday morning Elmer Ashton, of the technical staff of the Lehigh Portland Cement Co., addressed the convention on the subject of good roads and the importance of their construction to the build-

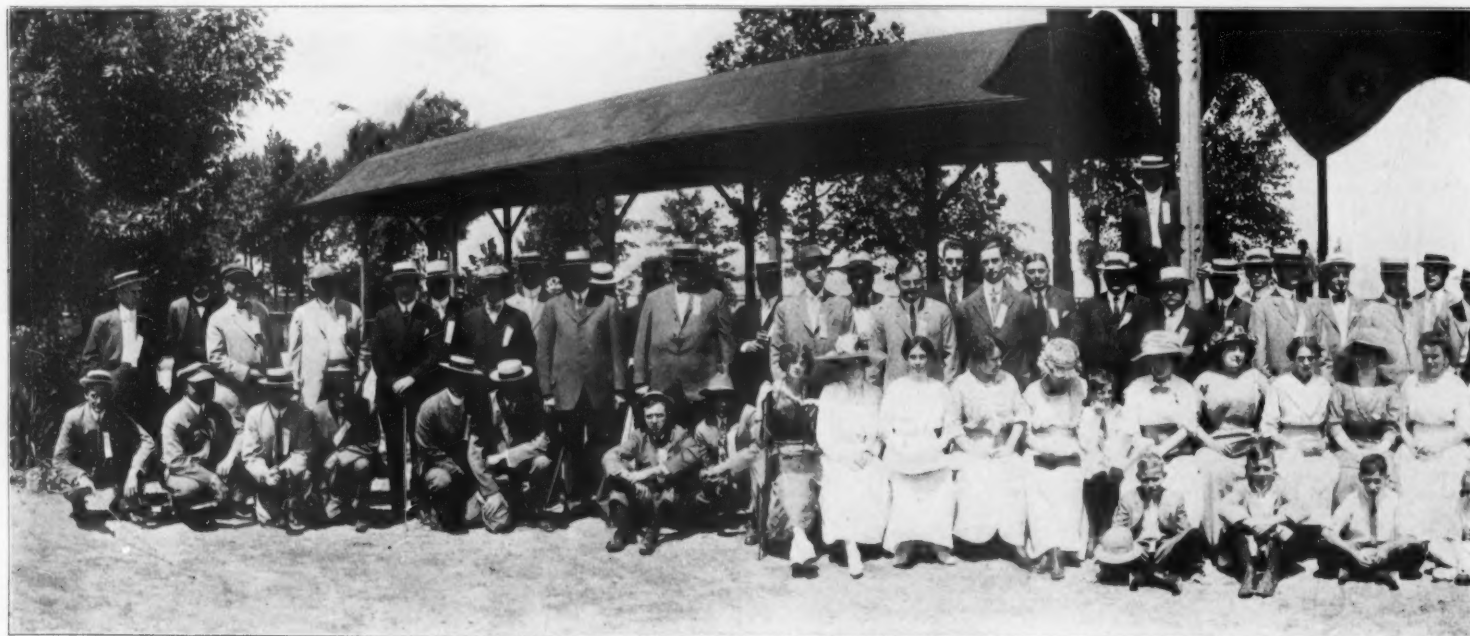
ers' supply industry. Mr. Ashton had his subject splendidly classified and was full of figures and data, which he gave out in such a way as to make a most interesting talk on the all important subject of road improvement. Taking the official statistics of various countries, Mr. Ashton found that in Germany the cost of hauling farm produce to market has been shown to be six cents per ton per mile; the average cost in the Republic of France is ten cents per ton per mile, while in the United States by our government statistics it is 23 cents per ton per mile. The speaker showed how this cost of transportation comes down to the consumer in the cost of the products which he is bound to use. The average haul in both France and Germany is much shorter than it is in this country, our average haul being seven miles for every pound of farm produce that comes to market.

Recognizing the importance of the transportation problem, Mr. Ashton analysed the situation thoroughly, so as to take up not only the practical business end of the discussion, but the moral and sentimental sides as well. Taken all in all it was one of the best good road talks that many of the members had ever heard. One conclusion that was brought forcibly to the front was that all recognized road building authorities now consider that there is no way to make a permanent road either so good or so cheap as to provide that road with a concrete base. The best authorities of the bitumen road products state that they would consider nothing else a good road than one having a concrete base. The same is true of those who advocate the brick surface, or any other surfacing that is worth consideration.

The splendid showing which has been made by the Road Commissioners of Wayne County, Mich., was cited to show the value and the future possibilities of the exclusive use of concrete for both foundation and the top surface of hard roads. The sixty-five miles of concrete roads in Wayne County, Mich., have required no more than \$300 for their repair per annum, which compares most favorably with that of the records of any other type of road construction which has been used in this country.

In closing, Mr. Ashton spoke of the great road project which we have come to know as the Lincoln Highway project, which will be the connecting of the Atlantic seaboard with that of the Pacific with a great transcontinental highway. That such a road is possible, that it will have a great influence in the building up of a higher and broader civilization for our country, there is no doubt, and Mr. Ashton gave in detail the progress that is being made on this great national project.

He was given a cordial vote of thanks at the close



O. B. S. A. AT CEDAR POINT MIDSUMMER OUTING.

of his address, and practically every attendant at the meeting expressed their deep appreciation of the instructive features of Mr. Ashton's address.

After a brief and interesting discussion of business matters, particularly the new automobile feature for hauling purposes, the meeting adjourned in peace and harmony.

NOTES OF THE MEETING

"Long Jim" Donovan, of the Alpha Portland Cement Co., won the bon mots of all the ladies with his splendid bass voice. He sang "When the Sands of the Desert Grow Cold," and several other selections, and they very unwillingly let him go when he declared he would have to practice some new pieces.

Harry Rauch and Charley O'Donnell enjoyed front seats at the rail of the Pavilion watching for ships and other things out in the water.

One feature was lacking which has always been one of the most enjoyable. Al Gallagher's yacht failed to show up, because it was reported that he was sick.

A. Y. Gowen's splendid ship, the "Speed Jacks," is being prepared for a big race occasion at the eastern end of the lakes, and it is supposed that Mr. Gowen was inspecting the fleet of the Perry Centennial, or some other aquatic stunt, for that ship failed to break the horizon also.

There was a big party of ladies with a few attendants that went over to Kelley Island to see the big plant where they burn lime, and everybody was talking about the Perry Centennial and the resuscitation of the flagship "Niagara," which had so much to do with the winning of the great battle of the lakes in Put-in-Bay one hundred years ago.

There was a baseball game on the beach without surplus clothes, which has been reported to the managers of all the great leagues to let them know where they can look for a supply of real players. Will Fay batted the ball clear over the pavilion; Stanley Rhoads made a throw which has not yet been measured, for if the ball ever came down nobody saw it. Colonel Viets made a record run. Harry Scott, W. K. Evans, Tom Hughes and Neeley were the fielders, and all of them got blisters from catching the ball, as well as other blisters which they took home with them.

W. H. Murray, of the Crescent, took in every dance at the pavilion the first night, and was a good boy ever after.

Ben McCausland refused to go in bathing, because he says that the bigger a man is the more the sun-burn hurts.

Eli Harpham came over from Akron to Sandusky in his machine, and made the trip in three hours. That was going some, and he looked just as fresh as a daisy.

Will Urshell only spent one afternoon at the Breakers and felt confident they were all having a good time.

Stanley Rhoads and Will Fay went down to the shooting gallery and shot up all the clay pipes and clay pigeons that the man had, so that he was glad to get rid of our crack shots.

Charley Schaeffer, who is a canoe paddler of national reputation, says that there is no way to under-

stand the great flood in Dayton this spring by those who never handled a oar for 20 hours, as he did.

Teddy Walton sagely remarked to Jim Adams and Howard Arnold that under present conditions we have all got to stand together, or there will be a great fall, in referring to the conditions of trade, and in fact this was the pith of his speech that carried the Ohio association into the National.

When the picture man came around with his big panorama camera there was a rush for the front seats, and the kids got them of course. By the way, that is about the finest bunch of kids that could be collected right down in front of the picture. They show the hope of Ohio in the future and the cause of the present efforts of their doting parents. Sure such a cause is worth while.

There is no way to finish this story, because there are as many sides to the summer outing of the Ohio Builders' Supply Association as there are people present, and each one sees good things, pretty things, and a good time every minute they are together. Such are typical Americans in business and at play at this particular moment in the development of our peculiar type of civilization.

THE ATTENDANCE

Paul H. Jandernal, Lehigh Portland Cement Co., Cleveland.
Chas. A. Gross, the Gross Lumber Co., Bellevue.
J. W. Thomson, A. H. Thomson & Son, Coshocton.
J. C. Neeley, Neeley & Farrell, Canton.
Chas. L. Johnson, Atlas Portland Cement Co., New York.
G. J. Klamme, Kelley Island Lime and Transport Co., Cleveland.
C. B. Brigham, Atlas Portland Cement Co., Columbus.
W. F. Powell, Atlas Portland Cement Co., New York.
J. G. McCracken, McCracken Builders Supply Co., Cincinnati.
Chas. W. Schaeffer, Schaeffer & Gengnagle, Dayton.
B. W. McCausland, United States Gypsum Co., Cleveland.
Chas. A. Kimball, Atlas Portland Cement Co., New York.
Edw. C. Swessinger, Kelley Island Lime and Transport Co., Sandusky.
Chas. Schmutz, Crescent Portland Cement Co., Youngstown.
Sam J. Vail, Alpha Portland Cement Co., Detroit, Mich.
W. F. Voegelé, Voegelé Bros., Mansfield.
Wm. Urshell, Woodville Lime and Cement Co., Toledo.
J. L. Price, J. L. Price Co., Marion.
G. H. Uthoff, the S. M. Cole Co., Genoa.
W. F. Rossiter, Cleveland Builders' Supply Co., Cleveland.
W. A. Fay, Cuyahoga Builders' Supply Co., Cleveland.
J. W. Windsor, Houston Bros. Co., Pittsburgh, Pa.
H. F. Fraley, Lorain.
A. J. Clements, the Greer-Beatty Clay Co., Massillon.
Geo. D. Elwell, Albany Builders' Supply Co., Albany, N. Y.
W. H. Greer, Greer-Beatty Clay Co., Magnolia.
H. T. Eaton, Niles.
C. A. Brown, Houston Bros. Co., Cleveland.
H. M. Scott, Lehigh Portland Cement Co., Chicago, Ill.
J. Speed, Reynolds Asphalt Shingle Co., Detroit, Mich.
I. W. Laidley, Reynolds Asphalt Shingle Co., Columbus.
Henry A. Conlin, Toledo.
C. B. Rogers, Lehigh Portland Cement Co., Cincinnati.
Lawrence Hitchcock, Kelley Island Lime and Transport Co., Cleveland.
W. O. Kiracofe, Fishack Gypsum Co., Toledo.
R. S. Rhodes, American Sewer Pipe Co., Akron.
J. C. Breen, Logan.
Morris M. Hunter, Edison Portland Cement Co., New York.
W. E. Viets, Lehigh Portland Cement Co., Chicago.
E. W. Savage, Kelly Plaster Co., Sandusky.
D. E. Boyle, Kelly Plaster Co., Butler, Pa.
Walter Fishack, Fishack Gypsum Co., Toledo.
James Quinn, Jr., Kelly Plaster Co., Grand Rapids, Mich.

Fred Wright, Kelly Plaster Co., Baltimore, Md.
W. H. Murray, Crescent Portland Cement Co., Wampum, Pa.
Edw. A. Roberts, president, Builders' Exchange, Cleveland.
Geo. A. Rutherford, Builders' Exchange, Cleveland.
John Jauch, Rapp & Co., Columbus.
Chas. L. Pisor, Houston Bros. Co., Pittsburgh, Pa.
B. F. Martin, Houston Bros. Co., Findlay.
A. C. Armstrong, Thompson-Armstrong Co., Cincinnati.
A. J. Hartmeyer, Zanesville Grain and Builders' Supply Co., Zanesville.
D. K. Thompson, Thompson-Armstrong Co., Columbus.
Arthur N. Black, American Gypsum Co., Port Clinton.
F. J. Griswold, American Gypsum Co., Port Clinton.
T. L. Hughes, Universal Portland Cement Co., Pittsburgh, Pa.
L. B. Woodworth, Universal Portland Cement Co., Toledo.
A. B. Hayes, Robinson Clay Co., Akron.
Chas. O'Donnell, Buckeye Portland Cement Co., Bellefontaine.
Oscar G. Knoske, Alliance Brick Co., Alliance.
J. J. Donovan, Alpha Portland Cement Co., Pittsburgh.
S. C. Kelly, Kelly Plaster Co., Sandusky.
E. R. Seager, Lake Erie Builders' Supply Co., Cleveland.
F. P. Rusher, Lima Builders' Lumber and Mfg. Co., Lima.
A. E. Yoder, Orrville.
J. A. Noble, Salem Hardware Co., Salem.
Walter Locker, Bluffton Cement Block Co., Bluffton.
Fred J. Crisp, Geo. Crisp & Son, Akron.
W. S. Sutliff, Sutliff & Co., Fostoria.
J. C. Adams, Malcomson-Houghton Co., Detroit, Mich.
F. L. Johnson, Malcomson-Houghton Co., Detroit, Mich.
H. B. Arnold, Dayton Builders' Supply Co., Dayton.
Geo. Urshell, Woodville Lime and Cement Co., Woodville.
E. R. Albaugh, Logan County Lumber Co., Bellefontaine.
Milton Yoder, Belle Center Lumber Co., Bellefontaine.
B. H. Graham, Cleveland.
A. F. Champeney, Ackelson & Champeney, Oberlin.
W. E. St. Clair, Castalia Portland Cement Co., Sandusky.
A. P. Lyon, Lorain.
W. F. Prentice, Castalia Portland Cement Co., Sandusky.
C. L. Sailor, New Castle Portland Cement Co., New Castle, Pa.
P. R. Clark, General Fireproofing Co., Youngstown.
A. L. Martin, Garry Iron and Steel Co., Niles.
F. B. Peters, Superior Portland Cement Co., Cincinnati.
Ford Donnelly, Donnelly Bros., Cleveland.
J. F. Connery, New Castle Portland Cement Co., New Castle, Pa.
G. H. Faist, Woodville Lime and Cement Co., Toledo.
E. Ashton, Leigh Portland Cement Co., Chicago, Ill.
W. K. Evans, Sandusky Portland Cement Co., Toledo.
Wm. C. Hunter, Frank Hunter & Sons, Columbus.
F. G. Black, Mansfield.
E. S. Walton, Youngstown Ice Co., Youngstown.
Clifford A. Owen, John Owen & Son, Owen.
Harry F. Rauch, Superior Portland Cement Co., Cincinnati.
Elihu Harpham, Buckeye and Summit Sewer Pipe Co., Akron.

THE PRESS

Fred K. Irvine, Rock Products.
W. A. McCall, Builder's Record.

THE LADIES REGISTERED

Mrs. P. A. Jandernal, Cleveland.
Mrs. Chas. A. Gross, Bellevue.
Mrs. J. W. Thomson, Coshocton.
Mrs. J. C. Neeley, Canton.
Mrs. C. L. Johnson, Sandusky.
Mrs. G. J. Klamme, Cleveland.
Mrs. C. B. Brigham, Columbus.
Mrs. W. F. Powell, New York.
Mrs. J. G. McCracken, Cincinnati.
Mrs. Chas. Schaeffer, Dayton.
Miss Schaeffer, Dayton.
Mrs. B. M. McCausland, Cleveland.
Mrs. E. C. Swessinger, Sandusky.
Miss Mildred Swessinger, Sandusky.
Mrs. Chas. Schmutz, Youngstown.



O. B. S. A. AT CEDAR POINT MIDSUMMER OUTING.

Mrs. S. J. Vail, Detroit, Mich.
Mrs. W. F. Voegelé, Mansfield.
Miss Susannah Voegelé, Mansfield.
Mrs. Wm. Urschell, Toledo.
Mrs. J. L. Price, Marion.
Miss Mildred Price, Marion.
Mrs. E. Harpham, Akron.
Mrs. G. H. Uthoff, Genoa.

Several other lady members failed to register and there were quite a number of little folks who helped immensely to make the pleasure of the occasion complete.

PITTSBURGH SUPPLY MARKET BROADENING

Pittsburgh, Pa., June 19.—There is a little more hope and cheer among retail dealers in builders' supplies the past month. Building operations are showing up in better shape. Architects report that many projects which were up earlier in the year have been refigured and are going ahead. Street work is more plenty, in fact in the city there is such an amount of it on hand now that the chief difficulty is getting men and teams. Most of the city builders' supply yards are fairly busy. The market for sewer pipe and paving brick is especially good. In cement, enormous sales have been made for the downtown buildings in Pittsburgh, but the business has been pretty well cornered. The tendency is to cut prices pretty hard on most lines of builders' supplies. Lath and shingles are an exception.

A meeting of the Builders' Exchange at its headquarters in the Fulton Building, June 18, was especially well attended and W. H. Stevenson, president of the Pittsburgh Chamber of Commerce addressed the Exchange on "Some of the Objects Accomplished by the Chamber of Commerce." He urged all co-operation among the building and industrial interests in this city. The speaker on June 25, at the weekly meeting of the Exchange, was John A. Ferguson, of the Bureau of Building Inspection, who discussed ably the "General Advantages of Fire Proof Construction," as shown by the recent progress in reinforced concrete construction.

The city of Pittsburgh is considering building a big municipal incinerating plant to take care of the rubbish from retail business places. It is estimated that about \$90,000 will be needed for the purpose and councils may make an appropriation shortly.

The capacity of the city filtration plant at Aspinwall, Pa., is likely to be doubled to give it a total capacity of 240,000,000 gallons daily. The filtration plant so far represents an investment of \$8,000,000 and the cost of the baffles to increase the capacity will be \$500,000 more. This is one of the projects which has required an enormous amount of material from builders' supply people the past two years.

The Nicola Building Co., which lately moved to its own quarters in the East End, has secured the contract for building 3,000 houses for the Mineral Fuel Company, at Fleming, Ky. During the past few years the company has built several thousand houses for the Consolidation Coal Co., of Fairmont, W. Va., and other big coal companies in that territory.

The Pennsylvania Railroad Co. has decided, in abolishing its grade crossings in the Brushton and Wilkesburg districts of the East End, to make a uniform seven track improvement. This will nearly double the amount of material to be used, according to the original plans.

More bills were passed by the legislature of Pennsylvania, which just adjourned, bearing on good roads improvements than in any previous session since the State Highway Department was established. If the people approve the proposed \$50,000,000 bond issue for state roads in Pennsylvania, it insures to the builders' supply interests in this city an enormous amount of business for the next two months. Appropriations made by the last legislature total \$6,800,000 for special purposes outlined in legislation enacted.

James M. Porter is busy this summer with a lot of fine paving contracts in Western Pennsylvania. He is a veteran brick man who knows the business from start to finish and has furnished material for some of the best roads in the Keystone state.

The William J. Payne, Jr. Co., which was re-organized last winter, is having a successful year and Mr. Payne is getting his hand in once more on some of the nice contracts for city work. He has always been known as one of the most successful building supply and street paving men and his friends are glad to see him back in harness.

The Crawford Construction Company has the contract for all the concrete piling to be used for the Farmers' Market on Duquesne Way between Sixth and Seventh streets, which the city of Pittsburgh will build.



HAROLD SWETT VISITING COUNTRY TRADE.

The Cummings Structural Concrete Company has secured contract for the Hights Run reinforced concrete bridge, being built by the city of Pittsburgh at the end of Butler street, East End. It will have a span of 216 feet and the arch will be 100 feet high. The same company has a splendid contract for driving hundreds of piles for the Norfolk & Western Railroad Company at Stoneville, Va. The track at this place is 160 feet above the river and the company is driving these piles, 60 feet long and 18 inches in diameter at the butt, at the side of the railroad track to prevent washing. The piles weigh seven tons each.

Irvin & Witherow report some good figuring on hand but few contracts being awarded just now. They have the contract for the reinforced concrete foundry of the Bronze Metal Company at Meadville, Pa., to cost \$55,000.

The Pittsburgh Engineering Construction Company has secured the contract for all the concrete work on two divisions of the Montour railroad now being built out of Pittsburgh. There will be a number of good-sized bridges and culverts in this job. The company reports much figuring and a very good outlook for fall business.

Owen Tyler has caused officials of the Louisville & Eastern railroad to sit up and evidence signs of interest by utilizing a big automobile truck for deliveries in Shelbyville, Ky. Freight rates of the L. & E. have been stiff in the past, that line having things its own way. Mr. Tyler secured a contract for 7,500 feet of Bestwall, and promptly shipped it to Shelbyville via truck. This method proved not only cheaper but quicker than the L. & E. service. The truck was a big five-ton affair, and walked off with the heavy load without trouble of any description. The cost of delivering by the truck was exactly \$15. The freight by railroad would have been \$15.75, exclusive of drayage charges both in Louisville and Shelbyville, that amounting to seven or eight dollars.

The social features of Atlantic City during the meeting of the American Society for Testing Materials always makes it a very pleasant occasion. The best technical talent of the country is made up of individuals who know one another well and also know how to be thoroughly alive all the time. While none of them can be found who is afraid of hard work, most of them can play just as hard. The picture of Logan Waller Page and W. M. Kinney represents a road conference with experimental machine. Of course that would be a concrete road of Kinney's making from Universal cement, and by the government specifications at that.



L. W. PAGE AND WM. KINNEY ON THEIR LATEST JOY RIDE.

JUNE BUILDING SHOWS DECREASE OF 13 PER CENT.

Building permits were taken out in June in sixty-eight cities to the number of 18,285, involving a total estimated cost of \$66,221,670, as against 19,683 permits, involving \$76,295,145, for the corresponding month a year ago, showing a decrease of 1,398 permits and \$10,073,475, or 13 per cent, according to official reports to CONSTRUCTION NEWS. As between gains and losses in different cities in the same section, contradictory conditions prevail and as a result the situation is somewhat complicated. There were gains in 33 cities and losses in 34 cities. As a whole the southern states make the best showing, there having been gains in ten cities and losses in only three. The figures in detail are as follows:

Cities	1913		1912		% Gain	% Loss
	No. of Bldgs.	Estimated Cost	No. of Bldgs.	Estimated Cost		
Chicago	1,969	\$ 7,379,000	1,371	\$10,655,900	30	
New York (Bronx Man and Bronx)	386	6,967,655	453	13,781,395	36	
Boston	493	6,946,000	417	4,725,000	47	
Philadelphia	1,450	4,135,590	1,405	2,877,535	8	
Pittsburgh	343	3,750,073	379	1,111,528	238	
Brooklyn	1,000	3,063,600	1,024	3,351,277	3	
Los Angeles	1,380	2,419,794	1,381	3,488,237	14	30
St. Louis	739	2,195,415	832	1,931,916	11	
Minneapolis	653	1,808,645	674	1,328,125	38	
San Francisco	466	1,675,554	514	2,054,542	18	
Milwaukee	400	1,481,580	444	2,187,493	15	
Rochester	319	1,444,103	392	1,251,406	15	
Cincinnati	1,389	1,399,625	1,326	814,346	71	
Newark	365	1,089,773	375	1,099,276	3	
St. Paul	367	1,050,530	429	1,054,592	8	
San Diego	269	1,018,700	359	657,268	65	
Portland, Ore.	472	1,001,415	443	1,176,605	14	
Indianapolis	572	958,085	690	1,038,150	16	
Dallas	196	936,015	149	361,314	66	
Kansas City	316	904,375	435	1,849,502	33	
Seattle	797	897,310	809	781,915	14	
Baltimore	367	746,567	399	528,751	41	
Memphis	267	715,648	386	709,227	3	
Atlanta	257	656,189	319	589,528	18	
New Orleans	285	642,264	301	234,627	174	
Springfield, Mass.	146	614,015	124	464,421	21	
Toledo	285	577,189	287	509,225	12	
Columbus	278	567,791	262	579,116	2	
Sacramento	191	558,310	79	137,107	265	
Worcester	190	527,973	302	769,527	30	
Tacoma	149	525,844	128	94,827	454	
Troy, N. Y.	63	524,358	66	60,116	772	
Oakland, Cal.	250	494,460	386	894,731	48	
Spokane	86	411,655	75	420,284	4	
Omaha	228	404,651	205	385,928	7	
Louisville	308	387,780	339	407,670	24	
Grand Rapids, Mich.	179	369,707	149	271,420	33	
New Haven	101	341,776	127	388,409	12	
Omaha	131	339,650	146	606,945	44	
Norfolk	77	339,517	73	217,398	51	
Hartford, Conn.	114	319,580	121	1,266,140	53	
Fort Worth	108	275,035	103	300,980	9	
Salt Lake City	65	249,748	63	800,700	68	
Des Moines	87	230,350	50	89,010	158	
Wilmington	64	226,280	48	110,592	104	
Berkeley	79	204,800	36	169,850	21	
Colorado Springs	28	189,701	31	34,980	667	
Charlotte	42	180,000	36	107,000	78	
Pasadena	124	159,014	138	309,599	49	
Jacksonville	71	157,687	119	258,469	37	
Stockton	25	157,415	49	78,380	100	
Richmond, Va.	113	158,778	185	785,453	79	
Chattanooga	168	138,715	185	47,920	179	
Duluth	168	145,284	134	244,105	40	
Evansville	130	141,025	140	222,300	36	
Tampa	128	132,199	101	60,470	118	
Lynchburg	40	121,810	81	127,160	11	
Davenport	84	108,610	31	89,775	21	
Peoria	80	90,650	58	153,465	40	
Wilkes-Barre	43	88,272	49	731,185	86	
Petersburg	42	84,584	96	810,867	59	
Harrisburg	23	81,875	37	119,830	32	
South Bend	45	58,185	36	48,060	33	
Topeka	47	51,565	49	139,845	61	
St. Joseph, Mo.	60	48,914	116	227,692	78	
Springfield, Ill.	30	47,870	47	110,945	57	
San Jose	28	29,290	45	46,315	37	
Total	18,285	\$66,221,670	19,683	\$76,295,145	13	

In the active cities of the Middle West there were losses in Chicago of 30 per cent; Milwaukee, 53; Indianapolis, 7; Fort Wayne, 9; Kansas City, 42; Omaha, 44; Davenport, 37; Peoria, 40; Springfield, Ill., 57, as against increases in Cincinnati of 71 per cent; St. Louis, 14; Minneapolis, 38; St. Paul, 3; Des Moines, 158; Grand Rapids, 33; Toledo, 7.

Of the eastern cities, Boston had a gain of 47 per cent; Philadelphia, 8; Pittsburgh, 238; Rochester, 15; Troy, 772; Wilmington, 104; Harrisburg, 33; Portland, Me., 21, with losses in New York 56 per cent; Brooklyn, 5; Paterson, N. J., 59; Hartford, 83; New Haven, 12; Worcester, 30; Springfield, Mass., 21; Wilkes-Barre, 86.

The North Pacific Coast cities seem to be doing a little better. A conspicuous feature of the situation in southern California is a loss of 30 per cent in Los Angeles as compared with the same month a year ago. The gains in the coast cities include San Diego, 55 per cent; Sacramento, 255; Berkeley, Cal., 21; Stockton, 100; Seattle, 14; Tacoma, 454, while there were losses in San Francisco of 18 per cent; Oakland, 48; Pasadena, 48; San Jose, 87; Spokane, 4; Portland, Oregon, 14.

The Southern cities make a good showing with gains in Baltimore 43 per cent; Norfolk, 51; Atlanta, 11; New Orleans, 174; Memphis, 1; Birmingham, 80; Charlotte, 78; Chattanooga, 179; Tampa, 119; Dallas, 66; with losses in Louisville 54 per cent; Jacksonville, 37; and Richmond, 79.

Harold Swett, of the Eastern Pennsylvania Division of the Lehigh Portland Cement Co., makes all his rural calls in an automobile. About one hundred cement salesmen are now using automobiles to reach the country trade with dispatch. The system is one of the bright thoughts of Bertram L. Swett, the far famed eastern sales manager of the Lehigh, who is by the way one of the veterans in selling cement. Harold, the younger brother, is also a swift actor on the firing line.

J. C. Printey, sales manager of the Sandusky Portland Cement Co., is having a tortuous session with a carbuncle.

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QUARRIES

RELATION BETWEEN THE TESTS FOR THE WEARING QUALITIES OF ROAD-BUILDING ROCKS.*

By L. W. Page.

It is generally accepted that the rock in a macadam road is subjected to the influence of three main classes of destructive agencies, and these are mechanical, physical and chemical. Thus the mechanical action of traffic grinds up the rock to powder, which is partially disseminated through the physical agencies, wind and rain. In addition, acids contained in the surface water tend to dissolve out the more solvent mineral constituents, thus aiding in the destruction. Then, too, the expansive action of frost is no inconsiderable factor in the disintegration of the wearing surface.

Of the destroying influences, however, the mechanical action of traffic is most severe, and this is a two-fold action. The impact of horses' shoes and wagon wheels fractures the rock, while at the same time it is worn away through abrasion, and, in order to resist rapid destruction, it must possess the properties of hardness and toughness. The hardness of a rock measures its resistance to the displacement of its surface particles by friction, while the toughness is a measure of its resistance to fracture through impact. These two primary requisite qualities are tested in the laboratory of the office of public roads by means of the Dorry hardness test and the impact test for toughness. In addition to these, a third test is employed, namely, the Deval abrasion test. The impact test and the abrasion test have both been adopted by this society.

The Dorry hardness test is performed on a core of solid rock, 25 mm. in diameter, which is held against a revolving cast-steel disk under a pressure of 250 g. per sq. cm. Standard crushed quartz, sized between 30 and 40-mesh screens, is fed upon the revolving disk. The specimen with its containing device is weighed before the test and again after the cast-steel disk has turned through 1,000 revolutions. The loss in weight is an index of the hardness of the specimen, and in order to make the results approximate those of the Deval abrasion test, the hardness coefficient is calculated by subtracting one-third of the loss in weight from the constant, 20.

The impact test is made on carefully prepared cylinders, 25 mm. high and 25 mm. in diameter, cut from the solid rock. A weight of 2 kg. is allowed to fall upon a spherical-ended plunger weighing 1 kg., resting in contact with the specimen. The height of the first blow is 1 cm. and each successive blow thereafter is increased in height by 1 cm. until the specimen ruptures.

The Deval abrasion machine consists of cylinders 20 cm. in diameter, by 34 cm. long, mounted at an angle of 30 degrees with the horizontal. The specimen consists of as nearly as possible 50 pieces of broken rock weighing 5 kg. After revolving the cylinders 10,000 times, the amount of material finer than $\frac{1}{16}$ in. is obtained and the percentage of wear is calculated on this basis. The French coefficient of wear is likewise used in reporting results and is calculated by dividing 40 by the percentage of wear.

Since the road material testing laboratory was established in the United States Department of Agriculture in 1900, several thousands of tests have been made on samples of rock submitted from various parts of this country and from foreign countries, and the test records furnish abundant opportunity for comparing the wearing qualities of different kinds of rocks with one another, and for determining the relative values of the several tests for estimating the wearing values of road building materials.

Relation Between the Dorry Hardness Test and the Author's Standard Impact Test.

The relation between the qualities of hardness and toughness is best seen by reference to Fig. 4, on which are plotted the results obtained from the tests of 1,538 samples of different kinds of rocks. The Dorry hardness coefficients are plotted as ordinates and the values for toughness as abscissas. The results are plotted using all of the tests per-

formed up to January 1, 1911. The individual results for hardness are averaged for the different values of toughness and the averages are shown in large circles, which are the gravity centers of the small circles. The solid line very closely approaches the points marked by the large circles.

Reference to the plotted points will show a very definite relationship between the properties of hardness and toughness. It will be seen that as the toughness of a rock increases the hardness likewise increases, with the increase in hardness occurring at a rapid rate for low values of toughness and very slowly for the higher toughness values. When the toughness is low, a very considerable deviation of the individual from the average hardness results will be noted. On the other hand, when the toughness is high, the individual results for hardness more nearly approximate the average results. A very important fact to be noticed is that when the toughness is high the hardness is invariably quite high. On the other hand, when the toughness is low, the hardness may be either high or low. It would seem, then, that although high hardness invariably accompanies high toughness, high toughness does not necessarily accompany high hardness. Another important point to be noticed is the fact that when a rock has an average value for toughness, its hardness is likely to be of average value or at least it will not be of unduly low magnitude. From a consideration of these facts, it is apparent that a toughness test might be used for a quick determination of the road-building qualities of a rock to the exclusion of the hardness test, although the reverse is not true, since it is possible for a rock to have very high hardness and at the same time be of extremely low toughness.

The relation between average hardness and toughness may be expressed mathematically as follows:

$$(\text{Hardness} - 20)^2 \times (\text{Toughness} - 2.2) = 100$$

or

$$\text{Hardness} = 20 + \frac{10}{(\text{Toughness} - 2.2)^{\frac{1}{2}}}$$

This equation expresses quite accurately the relation between the average values for hardness and toughness, but for low values of toughness it has no usefulness because of the wide deviation of the individual from the average results. However, for high toughness values, the hardness of a rock may be calculated with reasonable certainty, knowing the toughness. The assumption that a rock having infinite toughness will have the highest possible hardness coefficient (20) was used in deriving the above equation. This seems to be a reasonable assumption in view of the tendency of the hardness to increase with increasing toughness. The equation was likewise made to satisfy the average ordinates on the curve.

Relation Between the Deval Abrasion Test and the Author's Standard Impact Test.

The relation between percentage of wear and toughness decreases as the toughness increases, at a rapid rate for low values of toughness, and slowly for high values of toughness. The relation between the average values of hardness and toughness may be expressed as follows:

$$(\text{Percentage of Wear})^2 \times \text{Toughness} = 158.$$

The individual results for percentage of wear deviate considerably from the average results for low values of toughness. For high values, however, the deviation is not so serious. A rock with high toughness almost always has low values for percentage of wear, whereas a rock of low toughness may be either high or low in percentage of wear. The above relation, therefore, might be used to estimate approximately the percentage of wear of a rock when the value of the toughness is known, provided the toughness is high. It is impossible, however, to calculate the toughness when the percentage of wear is known. This equation was derived under the assumption that a rock of infinite toughness would have zero for a percentage of wear, and that a rock of zero toughness would have a high percentage of wear. At the same time the equation was made to satisfy the average of the plotted points.

Relation Between the Deval Abrasion Test and the Dorry Hardness Test.

The relation between the percentage of wear and hardness is shown graphically in Fig. 6. It was not considered that a curve of averages would indicate anything of value in view of the wide distribution of the individual results over the plot. A solid line was therefore not drawn through the various points. When the relations already given between hardness and toughness and the percentage of wear and toughness are combined, there results a relation between percentage of wear and hardness expressed as follows:

$$\begin{aligned} \text{Percentage of Wear} &= \\ &= (6320 \times \text{Hardness}) - 63200 - (158 \times \text{Hardness}^2) \\ &= (88 \times \text{Hardness}) - 980 - (2.2 \times \text{Hardness}^2) \end{aligned}$$

This equation expresses quite accurately the relation between the average values for percentage of wear and hardness, but it can be of no practical value in view of the wide deviation of the individual results from the average results. The relation between percentage of wear and hardness does not seem to be as definite as the relations between the percentage of wear and toughness, and hardness and toughness.

Granites are characterized by extremely high hardness with either high or low toughness, while the basalts are hard when the toughness is high and are either hard or soft when the toughness is low.

When the toughness of a rock is known, the hardness test is one that might well be omitted, since high hardness in the rocks ordinarily used for road building accompanies high toughness. The wearing qualities of a rock might be determined very definitely either by means of the toughness test or with the Deval abrasion test. The toughness test, in view of the small sample required, is perhaps a cheaper test to perform than the abrasion test. The abrasion test has the somewhat doubtful advantage of requiring the use of larger and better averaged samples than the toughness test, although even this advantage may be offset by using a sufficient number of specimens in testing toughness. Judging from the foregoing considerations it is the writer's opinion that the prime quality to be determined in a road-building rock is that of toughness. The resistance to wear might also be obtained as very useful information, whereas the hardness test is of least value and might be omitted.

HOLRAN COMPANY REMODELS PLANT.

The Holran Stone Company, New England Building, Cleveland, Ohio, has started to remodel its Maple Grove plant and contracts have been let for all the necessary equipment to increase the capacity of the present plant 50 per cent, so arranged that an additional 50 per cent may be added when necessary. The company will install a mammoth crusher, said to be the largest in the state, with capacity sufficient to receive stone 4 by 5 feet. The elevator will be the largest ever built, the buckets being 4 feet wide, 2½ feet long and 2 feet deep, with a capacity of one-half yard to each bucket.

The stone will be taken to the crusher by electric motor-driven car of ten tons capacity, controlled from a central station known as the Woodford system, and will be dumped into a large hopper, instead of into the crusher as in most plants. From this hopper it will be conveyed to the crusher by a heavy cast steel conveyor 5 feet wide operated by friction, controlled by an operator who will deliver the stone to the crusher as fast as the crusher can dispose of it. By this manner of feeding the machine its capacity will be increased 30 to 40 per cent, with only one man to feed it. Only one man will be required to move the stone from the large shovels in the quarry to the conveyor, and one man from the conveyor to the bins, thus making only two men in the operation, not counting the outside mill man and oiler.

G. W. Patnoe, general manager of the Holran Stone Company, stated that he expected to have the plant in operation by the 1st of September.

QUARRY LABOR SCARCE.

Every stone company in western Pennsylvania is complaining very hard all this summer of the scarcity of labor. It is almost impossible to get good help enough to man the quarries successfully. Foreign labor has gone to the mills and railroads, very largely because of the more steady employment in the winter. The experienced stone cutters and quarry men are coming over in smaller numbers from the old country and owing to the high wages being paid in the mills their sons do not take to the quarries as well as a few years ago. Some stone companies are paying \$2.25 per day now for the same grade of labor which cost them only \$1.70 last year and even at that price they are finding it very difficult to get men.

Announcement was made recently that Joseph B. Reinhard, a well-known stone quarry operator, is arranging to open a new stone quarry in the vicinity of Pleasant Hill, Pa.

Fire razed the office and warehouse of the Western Stone Company near Lemont, Ill., July 7, causing a loss estimated at \$3,000.

*Paper read at convention of American Society for Testing Materials, Atlantic City, N. J., June 24-28.

THIRD INTERNATIONAL ROAD CONGRESS. HELD IN LONDON, JUNE 23-28.

The Third International Road Congress was held at London, England, June 23-28, the formal opening of the congress taking place at the Wesleyan Central Hall, the Right Honorable the Chancellor of the Exchequer Lloyd George opening the proceedings and welcoming the delegates on behalf of the British government. Several thousand representatives of national governments, states, cities, public institutions and organizations of various kinds were in attendance. The congress comprised the meetings of the sections for the consideration of technical questions, committee meetings, an exhibition of road machinery and materials, social functions and excursions to road and other engineering works and points of interest in England, Scotland and Wales.

The work of the congress was divided into two sections, each of which comprised two sub-sections. The sections covered "Construction and Maintenance," "Traffic and Administration," etc. The sub-sections consisted of Questions and Communications, each having its own officers and conducting its sessions separately and independently, except in matters of common interest.

The road exhibition was held at the Royal Horticultural Hall, Westminster, comprising exhibits of machinery, materials, models, maps and publications. There were about eighty exhibitors from the various countries. The exhibits were divided into four classes, as follows: Class I., materials and tools; 2d class, traffic; 3d class, models, maps, drawings and publications, and 4th class, historical. The first class was arranged in two sections, for materials and machinery, respectively. Section 1 included samples of stone, broken and chipped, tars and pitches, bitumen and asphalt, various surfaces, and testing apparatus. Section 2 comprised rollers, steam dryers, tar macadam mixers, breakers, scarifiers, etc.

There were three sections in Class II. Section 1 consisted of mechanical vehicles for the transport of road materials; wheels and tires designed to carry heavy weights without damage to the roads; non-skid apparatus not damaging the roads, and light railway and tramway tracks. Section 2 was devoted to horse-traction exhibits, such as wheels and tires, non-injurious horseshoes, and shoeing with special reference to securing foothold. Section 3 included exhibits of appliances for highway and vehicle illumination.

Class III., in addition to the exhibits defined in the title, included statistics, forms of accounts, meteorological records, etc., while in Class IV. were shown specimen sections of road construction, old and new, and various historical exhibits.

The Permanent International Commission of Road Congresses held its first meeting at the Institute of Mechanical Engineers, President Albert de Preau-deau as chairman. The body considered plans for the fourth congress, audited the 1912 accounts, etc. It also confirmed the award of the prize of the Second International Road Congress to Francis Wood, M. Inst. C. E., of England.

The Cyclone Drill Co., Orrville, Ohio, report their business at the top notch. For the past two months the quarries have taken about 20 per cent of their total output. The following quarries have been recently equipped with from one to four machines each: Upper Hudson Stone Co., 26 Cortlandt street, New York City; Casper-Stolle Quarry & Cont. Co., East St. Louis, Ill.; the Holran Stone Co., Maple Grove, Ohio; Rensselaer Stone Co., Brainard Station, N. Y.; New York & New England Cement & Lime Co., 30 Broad street, New York City; Rockwell Lime Co., Manitowoc, Wis.; Milwaukee Falls Lime Co., Milwaukee, Wis.; Alpha Portland Cement Co., Easton, Pa.; Thomasville Stone & Lime Co., Thomasville, Pa.; Potomac Stone & Lime Co., Frederick, Md.; L. W. Lewis Sons, Emporia, Kan.; F. W. Menke Stone & Lime Co., Quincy, Ill.; Hillman Sand Co., Olive Hill, Ky.; Markle Stone & Lime Co., Markle, Ind.; Mace Lime Co., Rockfield, Wis.; Shore Lime Stone Co., Monroe, Mich.; C. B. & Q. Ry. Co., Burlington Building, Chicago, Ill., and Iola Portland Cement Co., Iola, Kan. Since work started on the L. & N. R. forty-eight Cyclone Blast Hole drills have been placed on the various contracts. The prospects for the balance of the year is all that could be desired. Up to this time the sales have exceeded any previous year.

An application for a charter for the Parker Quarries Company, Macon, Ga., was filed a few days ago in the superior court by T. C. Parker, H. V. Burnas and T. C. Parker, Jr. The capital stock is to be \$50,000, of which 10 per cent has already been paid in. Permission is asked to increase the capital stock at \$250,000 if it desired to do so. The company proposes to open quarries, crush rock and stone and take contracts for highways and ballasting.

Tiffin Lime Stone Co., Tiffin, Ohio; capital decreased from \$40,000 to \$20,000.

Notice has been filed of the dissolution of the Ellettsville-Perry Quarries Co., of Ellettsville, Ind.

Wm. D. Smedley has purchased 25½ acres at Narberth, Pa., and will reopen a quarry on the tract that has not been worked for several years.

Contracting Material Co., Chicago, \$2,500; quarry stone, digging sand, gravel, clay and earth, etc. Incorporators: Samuel G. Hamblen, William E. Jenkins and E. J. Moline.

New machinery is arriving daily at the quarry of the Storb Stone Co., Pool Hill, near Pine Forge, Pa. The plant will be run by electricity and is about ready to begin operations.

Stables of the Delaware River Quarry & Construction Co., at Gilboa quarries, near Lambertville, N. J., were destroyed by fire recently, with wagons, machinery, hay, etc. Loss, \$800.

McKee & Irvin, Attica, Ind., have begun work in the construction of a plant on the Wicker quarry, near that city. The limestone is of a fine, soft quality and has been found to contain 98.8 pure lime.

The New York and Indiana Stone Company, of Brooklyn, N. Y., was recently granted a charter under the laws of Delaware, with a capital stock of \$500,000, W. B. Holton, of Brooklyn, being the chief incorporator.

The Universal Crushed Stone Company has completed the work of installing new electrical equipment in its plant at Ives, Wis. Eleven motors, aggregating 1,100 horsepower, the largest being rated at 200 and the smallest being rated at 10 horsepower, have been placed in operation.

An investigation of the operation of all kinds of quarries, ore banks, oil and natural gas wells is provided for in a resolution adopted by the senate at Harrisburg, Pa., June 24, and sent to the house for concurrence. The resolution was offered at the instance of the department of mines, which desires to revise the laws relating to those operations.

John O'Laughlin, president of the O'Laughlin Stone Company, died at Racine, Wis., a few days ago. Mr. O'Laughlin was 57 years of age, was largely instrumental in the development of the limestone quarry industry in Wisconsin. He also was the inventor of various types of machinery used in the quarries.

Advices received indicate that the Utah Consolidated Stone Co., Salt Lake City, Utah, will shortly purchase additional machinery amounting to approximately \$40,000. The company will have a capitalization of \$200,000 and articles of incorporation were filed recently. Sydney H. Belmont will head the company. James B. White, James S. Walker, George Curley and E. T. Ashton are directors. George S. Ashton was elected secretary and treasurer and James B. White was named vice-president. E. C. Ashton will act as counsel for the company. The company is a consolidation of various stone interests.

At a meeting of the stockholders of the Connecticut Crushed Stone Co., Hartford, Conn., recently held ostensibly for the purpose of having a receiver appointed for the concern, a subscription list instead was produced and a start made toward raising \$15,000 with which to complete the work at the quarry and start operations. The \$15,000 to be raised is divided into two parts, \$5,000 by the stockholders and \$10,000 by Frank Slater, of New Britain, each side dependent on the other side raising the required amount. With this sum in hand, the officials predict that they will have the plant at Berlin in operation within fifteen days.

"Cyclone Drills" (catalogue B-25) has just been issued by the Cyclone Drill Company, Orrville, Ohio. The catalogue is quite elaborate from a printing standpoint and contains considerable valuable information in its seventy pages. It is 8½ by 11 inches and describes in detail the No. 14 quarry drill built in portable and traction styles to be operated by gasoline, electric, compressed air and steam power. This drill is now being used by a large number of quarry concerns producing limestone, trap rock and silica sand, and has been the means of cutting down costs very materially over methods previously employed.

PITTSBURGH QUARRY NEWS.

Pittsburgh, Pa., July 19.—Road stone is in fine demand this summer. County road work and city projects are keeping the lime stone quarries of western Pennsylvania exceptionally busy on this account. Those companies which grind stone for glass and foundry purposes are also much busier than last year. In bridge work there is not quite the same demand owing to the large amount of reinforced concrete construction being used. Ruble stone is a pretty good seller and railroads are taking large quantities of rough stone for all kinds of rip rap work. Prices in some lines are being cut pretty hard but business is brisk and stone companies in general are feeling good.

The Thomasville Stone & Lime Co. is running its plant at Thomasville, Pa., on the Western Maryland railroad at full capacity and is away behind with its orders. It can't get sufficient help to turn out its product fast enough. This company produces a very high-grade calcium stone for glass purposes and reports business entirely to its liking this year, with the exception of labor shortage.

T. K. Morris, whose big stone plant is located in Butler county, Pa., can't keep up with his orders this summer. His biggest shipments are for sidewalk stone and for stone to be ground up for city asphalt work in Pittsburgh, as he has practically all the contracts of this kind.

The Consolidated Stone & Mining Co. report shipments fair to good. It is making extensive repairs at present to its big crusher at Ellwood City, Pa. This company also reports a bad scarcity of labor.

The Fultinham Stone Co., capital \$25,000, is a new concern at Zanesville, O., organized with the following men: Harry C. Swingle, Charles G. Robinson and L. Swingle.

AMERICAN ROAD BUILDERS' ASSOCIATION.

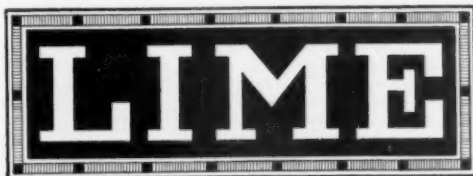
The board of directors of the American Road Builders' Association has decided to accept the invitation of the city of Philadelphia to hold its tenth annual convention and fourth American good roads congress in that city, December 9 to 12. This decision was reached after having carefully considered the facilities offered by a number of the other leading cities, including Chicago, St. Louis, Kansas City, Detroit, Milwaukee, Washington, etc. The convention and congress will be held in the First Regiment armory, at Broad and Callowhill streets.

The annual meeting of the American Road Builders' Association has become recognized as a leading event of the year among those actively interested in road construction and maintenance. It always brings together the most prominent men in the United States identified with road building and street paving who meet for the purpose of discussing the problems in which they are vitally concerned. Plans are now being laid by the officials of the association to make the Philadelphia meeting among the largest and most important gatherings of the kind ever held in the United States. As usual, there will be in connection with this meeting an exhibition, or rather exposition, of road and paving machinery, materials, etc. This feature, which is also under the auspices of the association, is a most important part of the meeting and is invariably participated in by the leading manufacturers of the industry. The main floor of the armory will be devoted to the exhibition feature, this floor being strong enough to hold the largest and heaviest machinery.

The American Road Builders' Association was formed in 1902 and is among the foremost organizations of its kind in the world.

Among the members of the American Road Builders' Association are the leading road and paving experts, highway officials, engineers and contractors in the United States. The president of the association is Samuel Hill, of Seattle, Wash., who is also life president of the Washington State Good Roads Association, and is also identified with other good roads organizations. The other general officers of the association are as follows: First vice-president, Harold Parker, ex-chairman Massachusetts highway commission; second vice-president, W. A. McLean, provincial engineer of highways of Ontario, Canada; third vice-president, George W. Tillson, consulting engineer, Borough of Brooklyn; secretary, E. L. Powers, editor Good Roads; treasurer, W. W. Crosby, consulting engineer.

The directors of the association include such well-known men as General T. Coleman du Pont; Nelson P. Lewis, chief engineer of the board of estimate and apportionment of New York City; William H. Connell, chief of the bureau of highways and street cleaning of Philadelphia; R. A. Meeker, state highway engineer of New Jersey; A. W. Dean, chief engineer Massachusetts highway commission; Austin B. Fletcher, state highway engineer of California, and A. H. Blanchard, professor of highway engineering, Columbia University.



THE NATIONAL LIME MANUFACTURERS' ASSOCIATION.

(Meets Semi-Annually.)

Officers.

President—Wm. E. Carson, Riverton, Va.
First Vice-President—J. King McLanahan, Hollidaysburg, Pa.
Second Vice-President—Lowell M. Palmer, Jr., New York, N. Y.
Third Vice-President—Geo. E. Nicholson, Manistique, Mich.
Secretary—Fred K. Irvine, Chicago, Ill.
Treasurer—C. W. S. Cobb, St. Louis, Mo.

Executive Committee.

Wm. E. Carson, Chas. Warner, L. Hitchcock, W. M. Hunkins.

SPECIFICATIONS FOR LIME.*

The committee respectfully reports that since its authorization in June, 1912, it has held seven meetings, and in addition the individual members have studied the problem from various standpoints. There has also been considerable correspondence between the different members. As a result of this work the committee submits the appended proposed Standard Specifications for Lime with the recommendation that they be adopted by the Society. The work of the committee had been complicated by the various uses to which lime is put, and the variation in the chemical composition and physical characteristics allowed or desirable for different purposes.

Few materials have so wide a variety of application as lime. Less than one-half of the product is consumed in the building trades where it is used chiefly in the making of lime mortars and plasters, and as an addition to Portland-cement concrete and gypsum plaster. The remainder of the lime produced is consumed by the chemical trade which embraces, besides agriculture, the manufacture of bleaching compounds, caustic alkali, gas, glass, paper, leather, sugar, soaps, oils and chemicals such as carbides, acetates, ammonia, etc. For these varied chemical uses, the physical qualities are less important than chemical composition, which may vary through various steps from practically pure calcium oxide to a lime in which the content of magnesium oxide may be about forty per cent.

In the building trade, the qualities of greatest importance for making mortars are the sand-carrying capacity and strength developed; for plastering, the plasticity, spreading qualities, constancy of volume and strength. These are largely independent of chemical composition and are affected by the treatment of the lime after delivery to the user as well as by the process of manufacture. It was therefore deemed advisable to limit the specifications to requirements directed to securing the proper chemical composition and preparation by the manufacturer.

For quicklimes, the chemical requirements are confined to specifying a certain content of calcium and magnesium oxides and placing a limit on the content of carbon dioxide, which is important as indicating either completeness of calcination or the extent, if any, to which the lime has been spoiled by air-slaking, after manufacture. The physical requirements are limited to the percentage of waste or impurities which the different grades of lime may contain.

For building and chemical hydrates, only the content of carbon dioxide and water are specified under chemical tests, as the total content of basic oxide will vary with the ratio of calcium and magnesium oxides present, and the consequent variation in the amount of water of hydration. The requirement that there shall be at least one per cent more water present in the hydrate than is required for the complete hydration of the calcium oxide insures complete hydration and acts as a check on the presence of an excessive amount of silica, iron oxide and alumina,—the impurities usually present in hydrates,—since the combinations they form with lime during calcination do not readily hydrate. For agricultural hydrate, the total content of magnesium and calcium oxide present is important and is specified.

In considering the omission of tests to determine the strength of mortars, it must be remembered that quicklime is but a partially prepared and perishable material, and the strength of mortars made from it will depend largely on its treatment after leaving the manufacturer. For this reason, together with the fact that the standard methods in use for testing other cementitious materials are not well adapted to the testing of lime owing to its slow rate of hardening, the committee decided to omit requirements as to strength. It, however, believes them to be desirable and is still engaged in an effort to develop suitable tests to determine constancy of volume, ease of working and cementing value, and asks to be continued.

Respectfully submitted on behalf of the committee.
HENRY S. SPACKMAN, Chairman.
E. L. CONWELL, Secretary.

*Report of Committee C-7 on Proposed Standard Specifications for Lime presented at Convention of American Society for Testing Materials, Atlantic City, N. J., June 24-28.

Definition.

1. Lime is a product resulting from the calcination, at a temperature below the cintering point, of a material containing carbonates calcium or of calcium and magnesium, which may be or has been converted to a paste or a dry flocculent powder, by slaking.

Classifications.

2. Limes may be divided into two commercial forms:

(a) *Quicklime*. A product coming from the kiln, without subsequent treatment, other than sorting, crushing or pulverization, which slakes on the addition of water. Quicklime may be shipped either as lump lime or pulverized lime. Lump lime shall be kiln size. Pulverized lime is lump lime reduced in size by mechanical means.

(b) *Hydrate*. A dry flocculent powder resulting from the hydration of quicklime.

Grades and Classes.

3. (a) Quicklimes are divided into two grades:

Selected. A well-burned lime, picked free from ashes, core, clinker or other foreign material.

Run-of-Kiln. A well-burned lime without selection.

(b) Hydrates are divided into two classes:

Building and Chemical. A lime hydrated to definite chemical proportions, and reduced to a fineness suitable for building purposes.

Basis of Purchase.

Agriculture. A lime reduced to a powder by hydration. As calcium and magnesium oxides play an important but distinct part as fertilizers, agricultural hydrates are divided into two classes, namely: high-calcium and magnesium hydrates.

4. Where quicklime or hydrated lime is to be used for chemical or agricultural purposes, the desired content of calcium or magnesium oxide shall be specified in advance by the purchaser.

I. CHEMICAL PROPERTIES AND TESTS.

Sampling.

5. *Quicklime in Bulk*. When quicklime is shipped in bulk, the sample shall be so taken that it will represent an average of all parts of the shipment, from top to bottom, and shall not contain a disproportionate share of the top and bottom layers, which are most subject to changes. The sample shall comprise at least 10 shovelfuls taken from different parts of the shipment. The total sample taken shall weigh at least 100 lbs., and shall be crushed to pass a 1-in. ring, and quartered to provide a sample of the size required by the laboratory. The sample to be sent to the laboratory shall immediately be transferred to an air-tight container.

6. *Quicklime in Barrels*. When quicklime is shipped in barrels, at least 3 per cent of the number of barrels shall be sampled. They shall be taken from various parts of the shipment, dumped, mixed and sampled as specified in Section 5.

7. *Pulverized Quicklime or Hydrated Lime*. The sample taken from either pulverized quicklime or hydrated lime shall be a fair average of the shipment. It is recommended that where conditions permit, 3 per cent of the packages shall be sampled. The samples shall be taken from the surface to the center of the package. The sample to be sent to the laboratory shall immediately be transferred to an air-tight container.

Chemical Tests.

8. (a) *Quicklime*. Selected quicklime shall contain not under 90 per cent of calcium and magnesium oxides, and not over 3 per cent of carbon dioxide.

(b) *Run-of-kiln quicklime* shall contain not under 85 per cent of calcium and magnesium oxides, and not over 5 per cent of carbon dioxide.

9. *Building and Chemical Hydrates*. Building and chemical hydrates shall contain not over 5 per cent of carbon dioxide, and not under 1 per cent of water in excess of that required to fully hydrate the calcium oxide present.

10. (a) *Agricultural Hydrates*. High-calcium agricultural hydrate shall contain not over 5 per cent of magnesium oxide, and not over 10 per cent of carbon dioxide; and shall contain not under 80 per cent of calcium and magnesium oxides figured on an anhydrous basis.

(b) *Magnesium agricultural hydrate* shall contain not under 5 per cent of magnesium oxide, and not over 10 per cent of carbon dioxide; and shall contain not under 80 per cent of calcium and magnesium oxide figured on an anhydrous basis.

II. PHYSICAL PROPERTIES AND TESTS.

Quicklime.

11. *Percentage of Waste*. An average 5-lb. sample of selected or run-of-kiln quicklime shall be put in a box and slaked with sufficient water to produce a lime putty, which shall be allowed to stand for 24 hr., then washed through a standard 10-mesh sieve. Not over 3 per cent of the weight of selected quick-

lime, nor over 5 per cent of the weight of run-of-kiln quicklime, shall be retained on the sieve. The sample taken for this test shall not be crushed finer than will pass a 1-in. ring, either before being sent to the laboratory or at the laboratory.

Hydrated Lime.

12. (a) *Fineness*. Building and chemical hydrates shall leave by weight a residue of not over 5 per cent on a standard 100-mesh sieve.

(b) *Agricultural hydrate* shall leave no residue on a standard 4-mesh sieve, and shall leave by weight a residue of not over 10 per cent on a standard 20-mesh sieve.

III. PACKING AND MARKING.

Lump Lime.

13. *Packing*. When not shipped in bulk, lump lime shall be packed in barrels, which may weigh either 200 lb. gross and contain approximately 185 lb. of lime, or 300 lb. gross and contain approximately 280 lb. of lime.

14. *Marking*. The name of the manufacturer, grade and gross weight shall be legibly marked on each barrel. Marking shall be blue for selected and red for run-of-kiln quicklime.

Pulverized Lime.

15. *Packing*. Pulverized lime shall be packed either in cloth bags containing 167 lb., or in paper sacks containing 80 lb.

16. (a) *Marking*. When shipped in cloth, the name of the manufacturer and the grade of lime from which it was prepared shall be legibly marked or tagged on each bag. The marking or tag shall be blue for selected and red for run-of-kiln quicklime.

(b) When shipped in paper, the name of the manufacturer and the grade of lime from which it was prepared shall be legibly marked on each sack. The marking shall be blue for selected and red for run-of-kiln quicklime.

Hydrated Lime.

17. *Packing*. Hydrated lime may be packed either in cloth bags containing 100 lb., or in paper sacks containing 40 lb.

18. (a) *Marking*. When shipping in cloth, the name of the manufacturer and grade shall be legibly marked or tagged on each bag. The marking or tag shall be blue for building and chemical hydrates and red for agricultural hydrate.

(b) When shipped in paper, the name of the manufacturer and grade shall be legibly marked on each sack. The marking shall be blue for building and chemical hydrates and red for agricultural hydrate.

(c) The marking of agricultural hydrates shall show whether they are high-calcium or magnesium.

IV. INSPECTION AND REJECTION.*

Inspection.

19. (a) All limes shall be subject to inspection.
(b) The lime may be inspected either at the place of manufacture or the point of delivery.

(c) The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered. The manufacturer shall afford the inspector all reasonable facilities for inspection and sampling, which shall be so conducted as not to interfere unnecessarily with the operation of the works.

(d) The purchaser may make the tests to govern the acceptance or rejection of the lime in his own laboratory or elsewhere. Such tests, however, shall be made at the expense of the purchaser.

Rejection.

20. Unless otherwise specified, any rejection based on tests made in accordance with Section 19 (d) shall be reported within five working days from the taking of samples.

Rehearing.

21. Samples tested in accordance with Section 19 (d), which represent rejected lime, shall be preserved for five days from the date of the test report. In case of dissatisfaction with the results of the tests, the manufacturer may make claim for a rehearing within that time.

Joel H. Watkins, geologist of the Southern Railway Company, while in West Point, Va., recently, found a natural shell bed, twenty feet thick, near the top of the ground that will, when analyzed, show from 70 to 90 per cent carbonate of lime. Efforts will be made to locate a lime-grinding plant there. The supply of shells is inexhaustible, of the highest quality, and can be had at practically small cost for the shells.

TO TEST VALUES OF CULTIVATORS.

Louisville, July 17.—Much attention has been attracted recently to the tract of land cultivated by the Kentucky Experiment Station, near Irvington, Ky. The tract was taken over last November and is being used to test the value of lime as a cultivator. The demonstration field is divided into five tracts. The first of these is not lime treated. Two of the plots have been treated to two and four tons per acre of finely ground oolitic limestone. Another plot is treated to four tons an acre of dust from hard limestone, crushed for road building and ballast. On another eight tons per acre of screenings from one-half inch to dust from hard limestone rock was spread. The work of preparation has been uniform on all the plots, all being seeded to cow peas and clover. The results of the treatment will be known shortly, and the value of lime as a cultivator established definitely.

The capital stock of the Michigan Lime Company, Petoskey, Mich., has been raised from \$200,000 to \$380,000.

Hewitt Marble Talc & Lime Company, capital \$500,000. Incorporators: J. H. Hildreth, Philadelphia, Pa.; H. M. Bailly, F. Giles, Wilmington, Delaware.

The Sheboygan Lime Works, Sheboygan, Wis., recently added an auto truck to its hauling equipment. The company also handles a full line of building materials.

The Marlbrook Lime Company, with headquarters in Roanoke, Va., is putting in a large plant at Marlbrook, in Rockbridge county, to grind lime-marl for agricultural purposes. The company has found a valuable mine of lime and marl. They expect to get their machinery well at work in about two months.

The Meese & Gottfried Company, well-known along the Coast as the largest manufacturers in the West of transmission, elevating, conveying and screening machinery, having outgrown their present main offices, have taken a ten years' lease for the four-story steel and brick building corner Mission and Annie streets, San Francisco.

The Chicago Architects' Business Association held its annual meeting Tuesday evening at the Lincoln Park refectory and elected officers and directors for the ensuing year as follows: President, Meyer J. Sturm; first vice-president, Arthur F. Woltersdorf; second vice-president, Joseph C. Llewellyn; treasurer, S. N. Crowen; secretary, E. S. Hall; assistant secretary, H. L. Palmer. Directors, Julian Barnes, George Beaumont, Frank E. Davidson, George W. Maher, Argyle E. Robinson, Harry B. Wheelock.

The American Society of Civil Engineers held its forty-fifth annual convention at Ottawa, Canada, June 17-20, with an attendance of about 350 members and guests. The convention was held in the Chateau Laurier and on behalf of Premier Right Honorable R. L. Borden, Hon. Martin Burrell, Minister of Agriculture, welcomed the society to the city. After the annual address by President George F. Swaine a business meeting was held, after which some interesting papers followed. The members were taken to the various points of interest in the city and were honored by a reception and dance by the Canadian Society of Civil Engineers.

"The Goodrich" for May, published by the B. F. Goodrich Company, Akron, Ohio, and Colombes, France, is a striking instance of the progressive methods employed by that concern in the dissemination of information relative to the country's highways. The Goodrich route book service has been established by the Goodrich company, carrying a full line of maps, both city and highway, which are very comprehensive. This route book service is free and is not confined to users of Goodrich tires, and may be secured by writing to the company's touring bureau. In addition to the route books referred to, the bureau lists about 400 independent tours covering many of the chief points of interest in the country and based on routes to and from all our principal cities. The company also plans out tours between given places, covering en route such intermediate points as may be desired by the individual motorists. The Goodrich company's new "Map and Guide to Continental Europe" is full of helpful hints and is free for the asking.

NEED OF HONEST CONTRACTOR.

Exactly one hundred per cent of adult humans want and need to own or build for themselves a home. In fact, the home-getting principle is universal and an indispensable necessity. Almost ninety per cent of the people of this country dread and fear to undertake the construction of a home for the protection of their families because of the unnecessary mystery and unscrupulous tricks in which the assembling of building materials and the employment of labor for building purposes is enshrouded. There is no reason why the price of an ordinary house could not be just as freely quoted as the price of shoes, neckties, shirts or any other indispensable necessity which goes to make up the current expenditures of civilized existence.

Without being able to define it as such, the ninety per cent who hesitate in dread realize that when they entertain thoughts of building they are going against a game, and usually a brace game, and not against a business proposition where the value of the thing delivered can be reasonably measured by the cost of its production. This is to a great extent the fault of the producers of building material, for the reason that they never advertise their goods as intelligently as it should be done. More than sixty per cent of the producers of building materials of all kinds use the expression, "We prefer to work in the dark and not let people know too much about the particular qualities, uses and adaptabilities of our goods. We prefer to work in conjunction with a selected list of contractors and agents, and in cahoot with these pump the people. For the money comes out of the people anyhow—the man who is going to build is the man who has to pay, and the more we get out of each individual builder the greater the aggregate of the spoils to be divided."

This is the style and type of reasoning that the average producer of building material assumes and holds. In this there is the greatest possible mistake, because such a process of reasoning, such an attitude towards the man who pays has just exactly the opposite results from that desired—ninety per cent of the people who would go to the idea of building are afraid of the methods of the mysterious system, which confines its efforts to the ten per cent who are bold enough and rich enough to go against the brace game. Ninety per cent will stand aloof and prefer to go without that home which is every civilized man's ambition than to dare to attack the den of lions.

By far the most important point for consideration by those contemplating the building of a home is the wisdom of building that home of properly selected materials and the choosing of a contractor of unquestionable reputation for honest, reliable workmanship. The average contractor is capable and trustworthy, but in this profession, as in all others, there are those whose methods should bear the light of investigation. His operations are insidious and deceptive and it is not until after the building has been erected for something like a year does his perfidy become apparent. While in the process of construction he may appear efficient, careful and sincere in his promise to give honest workmanship for the compensation received, yet this is only a mask to shield his parsimonious selection of materials during which his inventive mind creates a method of construction that conceals the real defects that might be otherwise observed.

Economy in the selection of the contractor does not always come within the meaning of that term, for it is often the case where the owner wishes he had paid \$300 more to some reliable man who could be trusted to put in his best efforts to build a dwelling that would justify the expenditure. Not until the plastering cracks and falls, the doors and windows come apart and the finish rubs off the trim, to say nothing of the burning out of the heating system, does the owner realize that his "economy" has been ill-placed and that the cost of repairs will greatly exceed the extra amount for which he might have had to pay for dependable work.

It is eminently fair, though, to let the contract to the lowest bidder; but the owner should be sure to invite only contractors of known reputation for doing conscientious work to submit their figures. As in all lines of business, the contractor noted for doing work cheaply, with price as his only solicitor, should be assiduously avoided, for he will prove by far the most expensive in the long run. When reasonable, it is essentially more economical to accept the bid of the best

man. It is a natural law that to give satisfactory work a contractor must be allowed a reasonable profit, and common sense decrees that he will not perform work at a loss to himself.

If the contractor is conscientious he may in many instances make changes in the specifications which will effect a substantial saving in the sum total that is to be paid for building the house. For not all architects have engineering knowledge or experience and plans and specifications especially designed for one building site will assume an entirely different contour on a lot of varying contour or in separate localities where materials and the procuring of them form a problem dependent upon local conditions. If he is learned in the building of dwellings he will, if he is honest, make alterations and changes in the specifications to meet local conditions and in cases where his knowledge prompts him to make substitutions of smaller or less expensive materials if the original specifications be superfluous.

The selection of a good man is not at all a difficult matter. Simply request that he show some of the homes he has built, preferably one or two that were constructed some few months or a year back. He will be glad to have his work inspected if he is reliable. And by all means the owners of those buildings should be talked to. They are the real judges of the situation and if they are satisfied with the work done an emphatic stride will have been taken, for by the natural order of things they are wont to adopt a critical attitude of the work done. Besides, the prospective builder can see for himself the quality of work done by the contractor.

Contracts for the general construction, the plumbing and the heating should be let separately. If the entire work of building the house is let to a general contractor he will in turn sublet the plumbing and heating to subcontractors on a competitive basis and will exact a charge of at least ten per cent from the owner for his trouble. By letting the contracts separately the owner can thus save this ten per cent by securing his own subcontractors.

The proper way to have a contract drawn up is by an attorney. While the blank forms of contract usually carried by architects cover in large measure the requirements of the home builder, yet in most cases there are special features desired and certain changes to be made, and it is distinctly advisable that an attorney draw up such requirements.

A set of specifications does not constitute a building form of contract, as seems to be the opinion of some people. The specifications simply indicate the kind of workmanship, the kind and quality of materials and other items which cannot be conveniently shown or specified upon the working drawings.

Except in cases where the contractor's reputation and financial standing are unimpeachable, he should be required to put up bonds to complete his work in a satisfactory manner. It should be remembered that the owner is responsible by law for the payment of the bills for material or labor, the contractor being merely an agent for the owner.

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PITTSBURGH SAND AND GRAVEL NEWS.

Pittsburgh, Pa., July 12.—Sand companies are more than usually busy. Some of them report that they are away behind with their orders and new business is coming in faster than they can take care of it. River companies are working all their diggers and the market for sand in the city probably is better than it has been for a long time. This business has been pretty well cornered by three or four of the big concerns, so that there is some complaint among the outlying companies as to the lack of house building operations which should furnish them business this summer. In towns outside of Pittsburgh, especially in the Mahoning and Shenango river valleys, there is a very active trade.

The Pennsylvania Glass Sand Company reports an excellent business this year. The comparatively mild winter favored it decidedly and its total of business up to July 1 was away ahead of 1912. It reports that nearly all glass companies are done for the summer and that shipments on this account have been discontinued, to resume August 15.

The Ohio River Sand Company announced a very good business. It is working one digger still at its plant at Ambridge on the Ohio River. Prices are very good and the company's business, which is confined to carload lots exclusively, is growing steadily.

The Elwood Sand Company, whose plant is located in Beaver county, Pennsylvania, has been busy this summer grinding foundry sand. It reports some dropping off in demand just now, due to the fact that orders secured by the foundries are not so plenty as a short time ago.

The James Jiles Company, which also makes a specialty of foundry sand, is working its plant at Thirty-eighth street and Liberty avenue, and also the two north side plants, at full capacity. Its officials report this year's business very much better than that of 1912.

The Iron City Sand Company is having built at the McCune Ship Yards at Dravosburg, on the Monongahela river, the largest sand boat and dredger that ever appeared on local waters. It is 168 feet long and in its construction there will be used 60 tons of structural steel and 180,000 feet of lumber.

Samuel Crowther, aged 45, superintendent of the Dick Sand Company at Franklin, Pa., was shot and killed two weeks ago by an employe of the company, it is alleged.

The plant of the East Liverpool Sand & Gravel Company, at East Liverpool, Ohio, resumed a short time ago and now employs 40 hands. Phillip Morley is general manager.

Articles of incorporation were filed a few days ago by the Salco Sand & Gravel Company, of Benton, Ark., with a capital stock of \$25,000, of which \$18,500 has been subscribed. The incorporators are F. C. McClanahan, Joe Berger, Sr., Ike Kempner, Hugo Heiman, Berger Realty Company, Abe Kempner, Jesse Heiman and M. J. Kempner.

LOUISVILLE SAND AND GRAVEL NEWS.

Louisville, July 19.—A bit below normal is demand for sand and gravel in this territory at present, the building situation failing to show its usual July strength. However, demand has improved following the Fourth of July, and the prospects are for a revival until cold weather puts a temporary end to the sand business. There is plenty of small work in and around Louisville, though buildings of unusual size are a bit scarce. Sand and gravel men, therefore, have no fear that they will have a poor year. The market has been steady, as usual, providing little for discussion. Sand and gravel seem to be among the few products that vary little in price. Labor, weather, and practically everything else under the sun change to some extent, but it appears that sand and gravel and the little brook go on forever at the same old figures and rates.

A 2,000-foot trestle is going up at the plant of the E. T. Slider Company and will be completed early in August, judging from present indications. The trestle will run from the river into the yards and will allow rapid handling of sand and gravel. Wagons will be loaded from the trestle in a minimum of time. A track three and one-half feet in width will be installed, with cars capable of carrying four yards of sand. A 10 per cent grade will be a feature of the trestle, which is of wood. This incline is slight enough to allow the cars to be handled without trouble. Capt. J. R. Mitchell, manager of the local branch of the company, reported business looming up in better shape, and with the prospects far from bad.

With demand in general rather quiet, the Patterson Sand Company, operating a big pit in the west end of Louisville, is finding conditions more favorable than for some time. The company is delivering heavily to construction jobs in the West End. Instead of the seven teams operated in the past, fifteen now are employed. The company is enjoying a big gain over 1912, every month showing a margin on the right side of the ledger.

The Louisville City Railway Company is again tearing up Fourth street to see what is on the lower side of the paving, and Andrew Hoertz is getting plenty of sand business out of the changes. The main thoroughfare of the city is to be repaved, and Mr. Hoertz, having what amounts to a monopoly on city railway business, is providing big quantities of sand and gravel all along the route. The local railway is having one of its most active years, and Mr. Hoertz is following suit.

Improvements of equipment are contemplated by the Ohio River Sand Company. A sand rehandling plant probably will be established in the West End in the near future, though the date of construction work has not yet been determined by President J. C. Duffy.

The Brownlee Park Gravel & Material Association, composed of Alfred Anderson and Ira A. Clough, of Chicago, and Martin P. Huyek, of Battle Creek, Mich., has filed articles of incorporation with \$15,000 capitalization, and will shortly commence work of establishing a permanent gravel supply station at the center gravel pit at Brownlee Park. The company has purchased the pit and has also purchased an outfit for digging and storing the gravel, as well as a big truck and trailer for supplying the gravel to the various building jobs about Battle Creek.

SOME OBSERVATIONS OF THE TESTING OF SAND.*

BY W. B. REINKE.

For any proposed piece of concrete construction, engineers as a rule, and rightly so, are very willing to inspect or have inspected the cement to be used, accepting as a matter of course the necessary expenses involved.

When the subject of sand testing is brought up, however, the reply is generally, "Oh! we don't care about that," or "We will have samples sent to this office and look at them to determine their value." As a rule, they are quite satisfied that they have taken care of everything needed to produce a good concrete when they write strict specifications for the cement. They "pat themselves on the back," look pleased and forget about the sand, overlooking the fact that this material is used as found in its natural state with every chance for wide variation in quality and that it forms from two to four times as much of the concrete as does the cement.

Few specifications contain definite requirements as to the quality of sand, the subject being dismissed with a general clause, providing that it must be clean, sharp and free from loam. As generally interpreted, the word loam includes clay matter and finely divided silica. Experience has shown that for the best results, work sand may be too clean, that it need not necessarily be sharp, and that under some conditions a certain amount of clay or finely divided silica is advantageous. The quality of sand is, as a rule, judged by the eye and touch. No attention is paid as to what the mineral constituents composing it may be; what granulometric analysis it may have; whether it may or may not contain minerals in a combined or free state, which will make it harmful to the concrete; whether it is so finely divided as, through the formation of colloids or otherwise, to retard or inhibit hardening of the concrete; or whether it may contain soluble alkalies, which may hasten the set of the cement to such an extent that the initial set is broken while it is still in the mixer and the whole mass becomes for a period, so far as setting is concerned, so much inert or at best feebly cementitious material.

For the last two years the company with which the writer is associated has investigated the reason for failure to harden properly of a number of pieces of concrete masonry. In some cases where the forms had been removed the concrete was showing signs of yielding to stress of its own weight, raising a question as to its ultimate stability. In others the hardening was being retarded, thus delaying the removal of forms.

From knowledge gained in these investigations, as well as results of many tests of sands carried on in our laboratory, certain salient features and characteristics of sands in general have been brought so forcibly to our notice as to make it seem imperative to pay quite as much attention, if not more, to the inspection of sand entering into any construction, as is paid to the inspection of cement.

It, therefore, seems advisable that a committee of this society be appointed to prepare definite specifications for sand and uniform methods for testing it.

* Paper read before convention of American Society for Testing Materials, Atlantic City, N. J., June 24-28.

TABLE I.—SHOWING LOSS IN TENSILE STRENGTH FOR EACH PERCENTAGE OF WATER REQUIRED TO BE ADDED TO MORTAR.

NORMAL CONSISTENCY																						
Period.		Ottawa Sand.						Work Sands.														
		9.2 per cent Water, 100 Tests.			12 per cent Water, 18 Tests.			12-13 per cent Water, 30 Tests.			13-14 per cent Water, 16 Tests.			14-15 per cent Water, 12 Tests.			15-16 per cent Water, 8 Tests.			Over 16 per cent Water, 16 Tests.		
		Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.
72 hours...	245	160	192	278	110	200	168	62	105	150	57	80	80	46	52	58	40	43	48	40	43	
7 days...	384	233	301	420	180	273	288	176	258	340	97	215	265	99	170	262	89	158	240	73	129	
28 days.....	502	300	410	605	270	388	462	277	377	493	165	325	455	133	262	321	183	251	340	129	187	

WORK CONSISTENCY																									
Period		Ottawa Sand.						Work Sands.																	
		13.8 per cent Water, 64 Tests.			17-18 per cent Water, 8 Tests.			18-19 per cent Water, 6 Tests.			19-20 per cent Water, 12 Tests.			20-21 per cent Water, 10 Tests.			21-22 per cent Water, 8 Tests.			22-23 per cent Water, 6 Tests.			Over 23 per cent Water, 10 Tests.		
		Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.			
72 hours...	190	100	140	115	80	92	92	80	86	67	58	63	63	52	55	50	18	20	20	12	23	31	10	18	
7 days...	280	178	235	236	170	208	210	140	180	187	107	146	150	110	128	158	100	122	125	95	111	120	58	92	
28 days.....	374	230	316	371	292	310	300	239	279	342	186	267	270	180	229	261	183	220	250	175	215	302	143	173	

TABLE II.—SHOWING LOSS IN TENSILE STRENGTH FOR INCREASED PERCENTAGE OF SAND PASSING NO. 40 SIEVE. NORMAL CONSISTENCY.

Period.	Ottawa Sand, 100 Tests.			Work Sands.														
				Up to 10 per cent, 10 Tests.			10-20 per cent, 15 Tests.			20-30 per cent, 15 Tests.			30-40 per cent, 16 Tests.			Over 40 per cent, 28 Tests.		
	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.
72 hours.....	245	160	192	260	143	190	190	125	152	135	90	125	170	44	83	110	40	61
7 days.....	384	233	301	420	222	340	343	225	270	262	110	222	288	100	200	265	90	170
28 days.....	502	300	410	605	380	438	431	296	365	403	187	344	462	178	311	376	133	271

Period.	64 Tests.			10 Tests.			11 Tests.			10 Tests.			22 Tests.		
	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.
	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.
72 hours.....	190	100	140	112	22	81	115	25	77	100	10	55	84	22	55
7 days.....	280	178	235	230	172	188	236	97	170	176	33	130	194	84	128
28 days.....	374	230	316	352	269	313	371	160	263	274	170	232	367	130	221

While the testing of sand is becoming more general, the work is being done under more or less tentative specifications prepared by individuals; no two laboratories seem to apply the same tests or use identical methods, the tests being carried out differently by each investigator. Most tests are made on samples delivered to the laboratories, no opportunity being allowed for the examination of the deposit or the selection of truly representative samples. The reason for this is chiefly one of dollars and cents, and since the condition obtains, the laboratory must do the best it can with the sample submitted.

The following are the usual tests to which samples of sand submitted for testing are subjected, but it is rarely that all are employed in any one laboratory:

1. Determination of the percentage of moisture;
2. Determination of the percentage of voids;
3. Granulometric analysis;
4. Determination of the percentage of silt;
5. Chemical analysis to determine silica and content of clay matter;
6. Loss on ignition;
7. Volume of mortar from a given amount of sand and cement;
8. Comparative tension tests of mortars made from work sand and standard Ottawa sand, using identical cement and only sufficient water to produce normal consistency.

At this point it is hardly necessary to call attention to the fact that although tension tests are used for testing sands, this practice would seem to be altogether arbitrary and has grown out of the long-established custom of making tension tests of cement, which, as everyone knows, was instituted only on account of convenience of having small portable inexpensive machines, which could be carried from one place to another without much trouble.

We would suggest that all comparative sand tests be made on cubes or cylinders subjected to compression, as concrete itself is rarely subjected to tension. This practice has been adopted in Germany, where tension tests of cement and sand mortars have been largely eliminated.

To the foregoing tests should be added several not usually carried out:

1. Microscopic examinations, which need not necessarily be exhaustive;
2. The effect on strength developed by the use of different cements;
3. Permeability of resulting mortars;
4. Weight per cubic foot as received and dried;
5. Determination of the amount of organic matter contained;
6. Tension or preferably compression tests on wet mortars, having the same consistency as used in the work.

This last test the writer believes to be the most important, and one to which all sands should be subjected. To the best of our knowledge, however, it is not generally used by laboratories other than the one with which the writer is connected.

The general practice in testing sands is to compare work sand with standard Ottawa sand, using the same cement, the briquettes being made from mortars having normal consistency, that is, the consistency of a 1:3 Ottawa sand mortar when made according to the standard methods for testing cement. In the test just referred to the sand is

made into a mortar of work consistency, that is, the consistency required in mortar to enable the concrete to be poured.

The practice of making comparative sand tests using wet mixtures was developed in our laboratory some years ago while we were trying to find the reason why a sand known to have caused trouble in a certain piece of concrete work gave, when mixed into mortar of normal consistency, tensile strengths greater than those obtained from the same cement and Ottawa sand.

The method of procedure in our laboratory is as follows: The sand to be tested and Ottawa sand are first made into mortars of normal consistency, using preferably cement from the work. These mortars are then made into briquettes, the whole operation being in accordance with the prescribed methods of this society for the making of sand briquettes when testing cement. The amount of water necessary to make a mortar of normal consistency having been found, a new batch of sand and cement in the desired proportions is thoroughly mixed dry and placed in a cylinder that can be revolved, together with a number of flint pebbles, so that the proportion of the cement, sand and stone will approximate that desired in the actual work. To this mix is added enough water (generally about 50 per cent more than needed for normal consistency) to make a mortar having work consistency. The cylinder is then closed and revolved for five minutes. The flint pebbles are picked out by hand and the mortar is made into briquettes. This test more closely approximates the conditions found in actual work, and the strengths obtained from briquettes made from such a mortar, though, as a rule, far below those obtained from a mortar of normal consistency, correspond to those that may be reasonably expected from the mortar if the sand and same cement are used in construction.

It is to be noted that in most cases, using the same cement, more water will be needed to bring a natural sand to normal consistency than is necessary with Ottawa sand. This difference in the amount of water required is accounted for by the difference in granulometric grading, the work sand, as a rule, having the greater amount of fine material, and hence more surface to be covered and a larger percentage of voids.

Further, it is to be noted that the strengths obtained from a natural sand when made into a mortar of normal consistency are often equal to or greater than those obtained with the same cement, using Ottawa sand. When the same natural sand and cement are made into a mortar of work consistency, which requires about 1½ times as much water as for normal consistency, the reduction of strength will be more or less marked, depending on the character of the natural sand. The strength of all sand mortars is affected by the amount of water used over that required for normal consistency. The more water used, the greater will be the loss in strength at early periods. The nearer a natural sand approaches the ideal in physical and chemical composition, the less will be the loss in strength for each additional per cent of water added. The amount of water required to bring a given sand to work consistency forms one of the best measures of the quality of sand.

In mixtures using 50 per cent more water than required to produce normal consistency, Ottawa

sand and good natural sands lose from 25 to 35 per cent of their strength up to the 28-day period, while a poor sand may lose as much as 70 or 80 per cent of the strength developed when made into mortars of normal consistency. It has been found by experience that with two sands, other things being equal, the one having the smaller amount of fine material will have the less amount of surface to be covered and when mixed with a given amount of cement will need less water to produce a definite consistency than the one containing a larger proportion of fine material.

Many engineers maintain that in making comparative tests of sand, the same amount of water should be used with each sand, overlooking the fact that in actual work one sand will require more water than another to bring the mortar to the consistency required by the work. We cannot assume that the same percentage of water will give the same consistency with two different sands. If this practice is followed one sand may have too much water and the other too little. In the actual work where the sand is to be used, a concrete of a certain consistency will be made with no regard to how much water is needed to obtain it, and in order that the test give a correct indication of the strength the sand will develop under actual work conditions, the test mortars should be made of a corresponding consistency. As stated before, most natural sands take about 1½ times as much water to produce work consistency as is required for normal consistency. This, however, is not true of Ottawa sand, which, while taking less water to produce normal consistency, requires more than 50 per cent addition to produce a mortar of work consistency.

In general, it may be assumed:

1. That the less water required to produce a mortar of a given consistency, the higher will be the strength developed by the sand.
2. That the coarser the sand, other things being equal, the greater will be the strength developed.
3. That the higher the silica content, other things being equal, the greater will be the strength developed.
4. That where it is necessary to use sands of poor quality, loss in strength at early periods can be largely overcome by using a dry concrete.
5. That the loss of strength is confined chiefly to short periods, being practically overcome with time.

The results of the tests recorded in Tables I to III will help to make these points more clear. They are the averages of tests made during the past year, and cover sands received from various parts of the country, made up with various cements. It will be noted that while the averages conform to the general rules above given, the maximum and minimum results given show variations. This is due to the fact that other conditions may overcome, to some extent, the particular effect the results are intended to illustrate.

The Eastern Sand Company, Camden; capital \$100,000; George H. B. Martin, Camden, N. J.

Amendments were filed by the J. Fred Smith Gravel Company, of Dallas, Tex., increasing capital stock from \$125,000 to \$200,000.

Virginia Silica Rock & Sand Corporation, Falls Mills, Va., was chartered with capital stock of \$50,000 to develop silica rock and sand deposits.

The Hendrick Hudson Sand & Gravel Company, Inc., of Manhattan, N. Y.; \$10,000; John Poillon, Bartholomew E. Longthou, John J. Hattigan; Thirty-second street and Broadway.

Stewart, Peck & Co., who control much of the sand business in Kansas City, have announced an increase in the price of sand of ten cents a square yard. Charles C. Peck, president of the company, announced that the increase was necessary because of the recent Kansas law taxing sand companies 5 cents a square yard for removing sand from Kansas streams.

One of the largest sand and gravel contracts ever given out was recently awarded to the Wheeling Wall Plaster Company, of Wheeling, W. Va., by the Federal Government for use in the construction of Dam No. 12, near Wheeling. The sand and gravel will be dredged from the river near the dam by the new sand dredge "Wheeling," which was recently built for the Wheeling Wall Plaster Company. The contract covers a period of three years. The general contractors for the dam are the Foundation Company, of New York City. The Wheeling Wall Plaster Company is one of the best known building material concerns in the country, they being the manufacturers of the famous "Wheeling" wall plaster. Owing to the rapid growth of their business it was deemed necessary to increase the capital stock to \$150,000.

TABLE III.—SHOWING LOSS IN TENSILE STRENGTH AS SILICA CONTENT IS DECREASED. NORMAL CONSISTENCY.

Period.	Ottawa Sand.			Natural Work Sands, with Silica Content of														
				Over 95 per cent.			90-95 per cent.			85-90 per cent.			80-85 per cent.			Less than 80 per cent.		
	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.
72 hours.....	245	160	192	200	165	187	185	90	160	168	80	136	165	40	80	56	41	41
7 days.....	384	233	301	414	280	330	379	160	272	290	97	232	317	90	211	276	130	213
28 days.....	502	300	410	568	435	487	605	256	398	462	165	360	414	195	326	415	190	298

Period.	64 Tests.			10 Tests.			11 Tests.			10 Tests.			22 Tests.		
	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.
	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.
72 hours.....	190	100	140	108	64	89	100	36	64	115	45	57	84	10	43
7 days.....	280	178	235	229	103	187	236	83	160	192	101	147	220	47	133
28 days.....	374	230	316	371	203	304	370	148	275	316	222	262	326	173	237

CLAY

THE TESTING OF REFRACTORIES*.

By A. V. Bleininger.

The subject of testing refractories is in a somewhat unsatisfactory condition, both from the standpoint of the consumer and the producer. This is not surprising, owing to the fact that these materials differ widely in composition and are used under greatly varying conditions. The subject has not been mastered as thoroughly as its importance deserves, as is evidenced by the many erroneous and misleading statements contained in books on metallurgy. It would seem desirable, therefore, that refractories be studied more exhaustively than has been done in the past.

Neglecting the subject of special refractories, the three classes of materials generally employed may be roughly grouped into clay, silica, magnesia and alumina refractories. The classification into neutral, acid, and basic materials cannot be justified owing to the indefiniteness of the term "neutral" and since many clay refractories are far from being neutral in their behavior towards slag. Again, while both the magnesia and alumina products might be included under basic materials they differ widely in their effect upon slags. It would seem more desirable, therefore, to adhere to the terms which at once indicate the composition of the materials.

In use, refractories are called upon to stand up under many conditions. They may be expected to resist high temperatures under negligible or under considerable loads, to resist abrasion at various temperatures, to prevent the intrusion of slags, glass, carbon or metallic vapors, to withstand sudden temperature changes, the effect of superheated steam, sulphurous or other gases, and other special conditions. It is manifestly impossible to expect that a single refractory will fulfil all of these functions with any degree of satisfaction. There are, however, certain requirements of characteristic importance which impart to refractories their greatest value, and of these refractoriness is obviously the most prominent. The lower the desired working temperature is for a certain material the easier it may be adapted to any particular requirement. From this it follows that the greatest difficulty is encountered in obtaining products of high heat resisting power, which at the same time possess some of the special requirements demanded. A valuation of these materials on the basis of their refractoriness would thus seem to be a fair procedure.

Fusion Tests.

Unfortunately, the term refractoriness has no specific meaning. Generally, it is supposed to represent the so-called melting point of a material. This confronts us with a serious difficulty due to the fact that the substances used for work of this kind possess no melting point in its proper physical conception. It is a well-known fact that silicates, like clays, lacking in well-defined crystalline structure and of high molecular viscosity, offer no definite transition point from the solid to the liquid phase, nor any other criterion, corresponding to the transformation of a substance from the anisotropic to the isotropic state. We are compelled therefore to depend upon deformation data, such as the rounding of edges, the bending of specimens of standard size and shape in the manner of Seger cones or the formation of drops. But even when a standard condition of deformation has been established it is evident from theoretical considerations that the rate

of heating will have a decided influence upon the deformation temperature, rapid firing resulting in a higher point than a slower rate of heating. This condition is made still more complicated by the heterogeneous nature of the materials to be tested, which consist of particles of different substances varying greatly in size. It is thus seen that the determination of the softening temperature is not as simple as it might appear, and that in the comparison of refractories a standard mode of procedure should be established. Fortunately, the higher the temperature involved, the less marked seems to be the influence of the rate of heating upon the deformation point.

In making a softening point determination of a refractory it seems desirable to grind the specimen so that the material will pass the 80-mesh screen and to make up small tetrahedra of the size of the higher pyrometric cones. It is hardly necessary to point out that any metallic iron introduced by grinding should be removed by means of a magnet. The furnace to be used should be a carbon-resistance furnace of the type, or still better, one heated by means of a coil of molybdenum or tungsten wire in an atmosphere of hydrogen. The Arsem vacuum furnace has been used very successfully by Dr. Kanolt in work of this kind. The crucibles or tubes used as receptacles for the specimens may consist of an alundum, or, for very high temperatures, of a fused magnesia body. It has been the experience of the writer that somewhat impure magnesia containing from 5 to 10 percent of ferric oxide, silica and alumina, is to be preferred to the pure substance for this purpose.

The deformation points to be noted are the rounding of the tip of the cone and the bending of the latter as prescribed for all pyrosopes of this kind. The temperature of these points is most readily estimated by means of standard cones, the deformation points of which should be fixed as closely as possible by means of an optical pyrometer, preferably of the Morse type. The specimen of refractory to be tested should be surrounded by a number of the standard cones and its appearance compared with that of the latter. Wherever possible, the direct estimation of the temperature, is, of course, preferable.

Load Test.

While for general comparison, the determination of the deformation point is very desirable and may be used as a criterion of the value of the refractory, it is by no means an accurate index of its behavior in use. Thus, a good many so-called No. 2 fire clays will show quite high deformation temperatures corresponding to, say, Cone No. 31, and yet fail under practical heat conditions. To a large extent this must be ascribed to the high viscosity of the materials, which causes them to deform but slowly and their heterogeneous structure.

In order to overcome this condition it has been suggested to subject the refractories to load conditions at an average furnace temperature, in which the compression of the specimen is only a small fraction of its crushing load at atmospheric temperatures. In this test the material is usually represented by a standard size brick placed on end and heated at a prescribed rate up to 1350° C., which temperature is maintained constant for one hour. The load is 50 pounds per square inch. The viscosity effect of the material, by virtue of which it is barely capable of sustaining its own weight at the higher temperatures, is overcome by this procedure, and in a measure the refractoriness is estimated, since failure occurs practically always through the softening and the deformation of the mass. At the same time the product is tested as a whole in the condition in which it is used so that the result takes into account the physical structure and other factors and represents, besides, the actual standing up quality under load conditions. This latter information is very desirable for many uses where the factor of load is involved, as for gas benches, arches, crowns, retorts, glass pots, etc.

Volume Changes.

A very important consideration regarding refractories is their change in volume upon heating in actual use, not considering that due to the thermal coefficient of expansion. Many materials of this kind are subject to positive or negative volume changes. These may be continued contraction, caused by insufficient firing in the process of manufacture, or the formation of glass from the several anisotropic constituents, the dissociation of clay into sillimanite, the transformation of quartz into tridymite and cristobalite, and other more or less unknown chemical and physical changes. This whole matter is one of considerable practical importance, since the irregular behavior of the materials in this respect may mean their failure in use. There is a somewhat general tendency to underburn refractories which needs correction. The claim made by some that fire bricks need not be burnt in kilns to the maximum temperature possible is fallacious in every case. For this

TABLE I.

Cone No.	Formula of Silicate Mixture.	Softening Temperature, deg. Cent.	
		Given by Makers.	From corrected data, by Kanolt.
26.....	0.3 K ₂ O 0.7 CaO 7.2 Al ₂ O ₃ , 72 SiO ₂	1580	1600
27.....	0.3 K ₂ O 0.7 CaO 20 Al ₂ O ₃ , 200 SiO ₂	1610	1620
28.....	Al ₂ O ₃ , 10 SiO ₂	1630	1635
29.....	Al ₂ O ₃ , 8 SiO ₂	1650	1650
30.....	Al ₂ O ₃ , 6 SiO ₂	1670	1670
31.....	Al ₂ O ₃ , 5 SiO ₂	1690	1685
32.....	Al ₂ O ₃ , 4 SiO ₂	1710	1705
33.....	Al ₂ O ₃ , 3 SiO ₂	1730	1720
34.....	Al ₂ O ₃ , 2.5 SiO ₂	1750	1740
35.....	Al ₂ O ₃ , 2 SiO ₂	1770	1755

reason the iron discolorations appearing on hard burnt brick are an indication of good burning and it is unwise to object to such products on the ground of their external appearance.

The question of volume changes is most readily investigated by reburning the product several times to temperatures not lower than 1350° C. and noting the differences in volume by means of the Seger volumometer, using as a check the determinations of the apparent and true specific gravity, the latter to be determined on the crushed material passing the 80-mesh sieve. At the same time there is need of much work concerning the thermal coefficient of expansion and other volume changes observed by linear measurements made upon specimens heated in appropriate furnaces.

Resistance to Sudden Temperature Changes.

The resistance of refractories to sudden temperature changes offers an important problem of great practical interest. In a number of laboratories such determinations are already being made by quenching, in cold water, bricks heated to redness and noting the number of quenchings required to destroy the brick. In the practice of the Bureau of Standards laboratory, however, it has been noted that this test, in spite of its apparent severity, is not as discriminating as the cooling of heated bricks on one side in a stream of cold air. In the latter test more severe strains are set up and the resisting qualities are more clearly brought out than in the quenching. It goes without saying that the conditions of the test should be made as strictly comparative as they can be made with reference to the heating, the air pressure, length of treatment, etc.

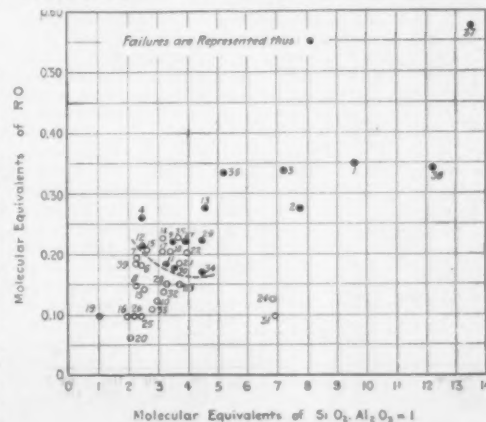
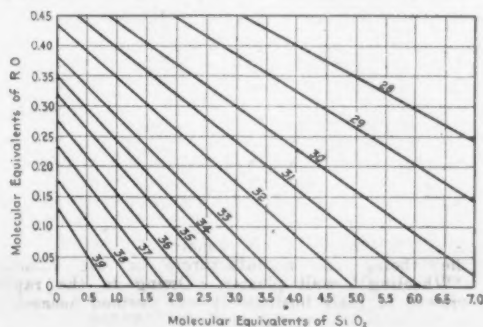
Resistance to Slagging Action.

Regarding the resistance of refractories to the action of slags it has been suggested by the Laboratory of the Tonindustrie Zeitung, Berlin, that cubes be made of the material to be tested, containing a depression, which is to be filled with the type of slag or glass under consideration. These are then carried in a furnace to a temperature sufficiently high to bring about fusion of the fluxing silicate. After cooling, the cubes are broken and their fracture studied. This procedure no doubt could be developed into a very instructive test which would be helpful to the manufacturer in developing the best conditions for resisting slag intrusion.

Chemical Composition.

In work with refractories it is very desirable to know the chemical composition of the materials to be examined, even though the physical tests are of more direct importance. If all of these products were physically homogenous the chemical composition would be of the greatest significance. It is obvious that the so-called impurities differ according to the type of the refractory. While in clay and silicious materials the fluxes comprise the basic constituents, iron oxide, lime, magnesia, potash and soda, in magnesite brick the silica, alumina and ferric oxide must be considered detrimental.

* Paper read at convention of American Society for Testing Materials, Atlantic City, N. J., June 24-28.



In comparing the composition of many refractories, especially fire clay products where there are about eight constituents to be considered, it is advisable to make use of empirical chemical formula in which the constituents of the same class are grouped together. By the artifice of making one constituent equal to unity it is possible to reduce the variables to two expressions. Thus, from the following fire-brick analysis, the formula given below may be computed:

Silica	65.34 per cent.
Alumina	30.01 "
Ferric oxide	1.45 "
Lime	0.18 "
Magnesia	0.52 "
Soda	0.38 "
Potash	1.21 "

0.061 FeO, 0.011 CaO, 0.044 MgO, 0.021, Na₂O,
0.44 K₂O, 1 Al₂O₃, 3.693 SiO₂.

This empirical formula is simplified by combining the fluxing constituents so that the final expression becomes 0.181RO, 1 Al₂O₃, 3.693 SiO₂, containing but two variables. The slight trouble involved in this calculation is amply repaid by the ease with which the chemical characteristics of the material may be summarized. Referring to fire clays, by comparing the resulting formula with that for pure dehydrated clay substance, Al₂O₃, 2 SiO₂, the silica in excess is at once noted. Similarly, the total fluxes expressed in molecular equivalents give an excellent index as to the amount of impurities and their joint effect, especially in connection with the silica content, since it must be realized that the basic constituents are the more potent, the more silicious the clay is. The practice of estimating the refractory value of a fire clay by adding the percentages of the fluxes, is quite misleading and is apt to lead to erroneous conclusions, since evidently the resultant effect is more apt to be proportional to the molecular amounts, than the simple weight relations.

Supplementary Studies.

Further study is needed also of the specific heat and the thermal conductivity of refractories, although such work as that of Wologdine and others has thrown considerable light upon the latter as applied to clay refractories.

In the discussion of the subject the question of the mortar used in laying up refractory products is a vital one and it might be stated that in each case the quality of the cementing materials should be equal to that of the bricks used.

In the following paragraphs some of the more important facts concerning the various grades of refractories are collected.

Clay Refractories.—The greatest heat resistance is shown by the purest clays, approaching the kaolin composition which corresponds to a composition of 53.8 per cent silica and 46.2 per cent alumina in the dehydrated state. Any increase in silica reduces the refractoriness, reaching a minimum point about 80 per cent silica and 20 per cent anhydrous kaolin. The softening temperature of the pure clay substance is about 1740° C. and that of the kaolin-silica minimum 1600°. The fluxes, comprising the basic oxide and titanium oxide lower the refractoriness very rapidly. Dr. Ludwig, in determining the softening temperatures of a large number of German fire clays, correlated these with a chemical composition as represented by the formula $a\text{RO} \cdot \text{Al}_2\text{O}_3 \cdot b\text{SiO}_2$. These results are in the diagram of Fig. 3.

For the sake of correlating the cone numbers with the approximate fusion temperatures, Table 1 is given for numbers 26 to 36.

From the isothermal lines of Ludwig's diagram it is observed that the effect of the fluxes becomes more potent as the proportion of silica increases. The results, however, cannot be applied directly without keeping in mind the fact that the lack of physical homogeneity will tend to displace the softening temperatures to a greater or less extent.

Dr. Kanolt in his careful investigation of the melting point of American fire brick found this temperature to vary between 1555 and 1725° C. The mean of the melting points of 41 samples of fire clay bricks was 1649°. From the experience gained in the testing of many brands of fire brick it would seem that no material of this kind may be called of good grade unless it shows a softening temperature above 1670°.

The behavior of these bricks under load conditions (50 pounds per square inch at 1350° C.), correlated with the chemical composition is shown in the diagram of Fig. 4. Failure was considered to have taken place when the specimens showed marked deformation or contracted more than 1 inch; referred to the standard length of 9 inches. It was found that a content of more than 0.22 equivalent of fluxes is apt to result in failure in the load test with a silica content varying up to 1Al₂O₃·3SiO₂. With a higher content of silica the permissible RO decreases. Thus with 4.4 molecular equivalents of silica a RO content of 0.07 may bring about failure.

Other properties such as the resistance to sudden heating and cooling must necessarily depend to a large extent upon the physical structure and very little data is available for the discussion of this topic.

The thermal coefficient of expansion of the various fire clay refractories likewise has not been studied in any extensive way and the constants available are meagre and to some degree unreliable.

The heat conductivity of these products has received more attention and the best known work referring to this point is that of Wologdine, who found this constant to vary from 0.0025 to 0.0045, referred to gram-calories, per square centimeter and through a thickness of 1 cm. for a temperature difference of 1° C. Generalizing, it may be said that the thermal conductivity varies inversely as the porosity.

The specific heat of raw fire clay was found by Knote to be 0.237 and of the burnt clay 0.200. No information is available as regards the variation of this constant for different clays and bodies of temperature.

Since it should be the invariable rule to burn all refractories to as high a temperature as possible in the kilns, the contraction upon refiring to say, 1350° C., should be as small as possible and should in no case exceed 1 per cent for high grade clay refractories.

Silica Refractories.—According to Dr. Kanolt the deformation point of pure silica is 1750° C., while that of silica brick was found to be about 1700°. The great value of these products in their industrial use is due to the rigidity of structure at permissible furnace temperatures. The decrease in viscosity does not take place over such a long interval as in clay and hence softening under load conditions is not so much to be feared. Failure takes place close to the softening temperature of the material. Silica brick, however, are more subject to spalling due to sudden temperature changes and cannot resist mechanical abrasion as well.

The most significant phenomenon connected with the use of silica bricks is their expansion upon further heating due to molecular changes, the formation of cristobalite, tridymite and glassy matrix. The mechanism of these transformations is not yet understood fully, nor the effect of the initial crystalline state upon the subsequent volume changes. Upon calcining silica rock repeatedly, great variations are found in regard to the expansion of the material; in some cases the maximum increase in volume is obtained after the first heating, while in others each subsequent firing causes persistently a steady increase. Cramer in refiring silica bricks of various brands in the porcelain kiln found that most brands ceased to expand after the third firing.

Some discrepancy of opinion exists also in regard to the difference in behavior between silica brick containing clay or lime as a binder. The general preference at the present time seems to be for the latter, at least as far as American practice is concerned. Chemical analysis is useful in estimating the impurities of silica brick, principally lime and iron.

In testing silica brick under load conditions, 50 pounds per square inch, at the Pittsburgh laboratory of the Bureau of Standards, no deformation or contraction was noted at 1350° C. nor at 1470°, thus illustrating the excellent standing-up quality of this material. The thermal conductivity of silica brick was found by Wologdine to vary from 0.0020 to 0.0031.

Magnesite Refractories.—These products, manufactured by calcining the crude mineral to a high temperature, crushing, briquetting and firing the resulting shapes at as high a heat as possible, in the nature of the case, are basic and very refractory. Kanolt found the melting point of magnesite brick to be 2165° C. Like silica bricks these refractories are sensitive to temperature changes and cannot resist mechanical abrasion very satisfactorily. For many purposes the magnesite products are indispensable. When properly calcined and burned very little shrinkage is found to take place in use. Pure magnesite is not desirable for this purpose owing to the difficulty in producing products of constant volume and a certain amount of iron oxide, silica and alumina seem necessary for this purpose. The most desirable compositions for the various purposes have not been worked out. The manufacturer is to a large extent dependent upon the composition of the raw material and chemical control is difficult under the circumstances.

In the load test (50 pounds per square inch) a magnesite brick was found to fail rather suddenly at 1550° C. It seems then that initial softening must take place at this temperature. Fused magnesite is at the present time being introduced as a special refractory for certain purposes. The thermal conductivity of magnesite products is considerably higher than that of the other refractories under discussion. Wologdine gives values varying from 0.0058 to 0.0071.

Alumina Refractories.—Pure alumina melts at 2010° C. (Kanolt). Refractories of this type, being made usually of a mixture of bauxite and fire clay, for this reason must fuse at considerably lower temperatures. Dr. Kanolt found the melting point of such products to vary from 1565 to 1760° C. This indicates no appreciable gain in refractoriness over the best fire clay materials. Bauxite was found by this investigator to fuse at 1820° and bauxite clay at 1795°. The thermal conductivity was found to be, according to Wologdine, about 0.0032.

The addition of alumina to fire clay increases the refractoriness of the latter. Upon continuing the increase in alumina the fusion temperature of sillimanite, 1810° C., is reached and finally the melting point of alumina, about 2010°, modified, of course, by the presence of fluxes like iron oxide, lime, magnesia and the alkalis.

One objection to bauxite brick has been that due to the continued shrinking of the material, caused by insufficient calcination of the bauxite. Of late bauxite or alumina fused in the electric furnace has been applied in this connection in the manufacture of high grade special refractories. The coefficient of expansion of a fused alumina (alundum) body, between 100° and 900° C., was found to be 866×10^{-6} .

Specifications.

Some attempts have been made to work out specifications governing clay and silicious refractories. In the following paragraphs two sets of tentative specifications are quoted, (a) those proposed by the English Institute of Gas Engineers, and (b) requirements suggested by the Bureau of Standards.

(a) **Proposed by the English Institute of Gas Engineers.**—It is understood that this specification applies generally to material made from fire clay containing approximately not more than 75 per cent silica. It is known, however, that there are in certain areas fire clays containing as much as 80 per cent silica, and material made from such clays shall be considered to conform to this specification if it passes the test herein specified.

1. **Refractoriness.**—Two grades of material are covered by the specification: (a) Material which shows no sign of fusion when heated to a temperature of not less than Segar Cone No. 30 (about 1670° C.); (b) material which shows no sign of fusion when heated to a temperature of not less than Segar Cone No. 26. The test shall be carried out in an oxidizing atmosphere, the temperature of the furnace being increased at the rate of about 50° C. per five minutes.

2. **Chemical Analysis.**—A complete chemical analysis of the material is to be provided when required.

3. **Surface and Texture.**—The material shall be evenly burnt throughout and the texture regular, containing no holes or flaws. All surfaces shall be reasonably true and free from flaws or winding.

4. **Contraction or Expansion.**—A test piece when heated to a temperature of Segar Cone No. 12 for two hours shall not show more than the following linear contraction or expansion: No. 1 grade, 0.75 per cent; No. 2 grade, 1 per cent.

The test piece shall be 5 or 6 cm. long, the ends being ground flat and the contraction measured by means of Vernier calipers reading to 0.1 mm., a suitable mark being made on the test piece so that the calipers may be placed in the same position before and after firing.

5. **Variation from Measurements.**—In the case of ordinary bricks, 9 by 4½ by 3 or 2½ inches thick, there shall not be more than ± 1.5 per cent variation in width or thickness, and in all cases the bricks shall work out their own bond, with not more than ¼ inch allowance for joint. In the case of special bricks, blocks, or tiles there shall not be more than ± 2 per cent variation from any of the specified dimensions.

6. **Crushing Strength.**—The material shall be capable of withstanding a crushing strain of not less than 1,800 pounds per square inch.

(b) **Specifications by the Bureau of Standards.**—In this connection the No. 1 clay refractories are divided into two classes, A and B. The first includes those materials for which both refractoriness and load carrying ability is required; the second those where refractoriness is demanded but compressive strength at furnace temperatures is not a main requisite. The No. 2 clays are supposed to include those products which are somewhat inferior to the high grade refractories, but which nevertheless form an important class of products suitable for many uses.

No. 1 A.—Materials of this class should show, when tested in the ordinary manner in the Deville or an electric furnace and heated at a rate so that the final temperature is obtained in not less than one hour, a softening temperature of not less than Cone No. 31, approximately 1690° C.

When subjected to the load test at 1350° C. and under a load of 50 pounds per square inch a standard fire brick tested on end should show no serious deformation and should not be compressed more than

$\frac{1}{2}$ inch referred to the standard length of 9 inches. When tested on end at atmospheric temperature, the compressive strength should not be less than 1,000 pounds per square inch.

The product in its manufacture should not be fired to a temperature lower than that corresponding to Cone No. 12, or approximately 1350° C.

Upon chemical analysis the empirical formula calculated from the composition should show a total RO content of not more than 0.22 molecular equivalent, including the iron oxide as FeO.

No. 1 B.—The average softening point of this class of products should correspond to a temperature of not less than Cone No. 31, about 1690° C.

In the load test it should show no serious deformation or a contraction of more than $\frac{1}{2}$ inch referred to in the standard length of 9 inches, at a temperature of 1350° C. and a load of 30 pounds per square inch.

When tested for compressive strength, on end, at atmospheric temperature the crushing strength shall not be less than 800 pounds per square inch.

The product shall not have been fired to a maximum temperature lower than that represented by Cone No. 10, about 1300° C.

The chemical formula calculated from the analysis should show a content of RO fluxes of not more than 0.22 equivalent.

One important point has been left unconsidered in these specifications, namely, the question of shrinkage or expansion upon heating fire bricks to higher temperatures. It was thought that the data at hand were insufficient to suggest any requirements.

No. 2. Refractories.—The softening point of this class of refractories should not be lower than the temperature corresponding to Cone No. 28, approximately 163° C.

In the load test the materials of this classification should be able to carry a load of 25 pounds per square inch at 1300° C. without serious deformation or a contraction greater than $\frac{1}{2}$ inch, referred to the standard length of 9 inches.

The chemical formula, as calculated from the analysis, should not show a content of more than 0.32 equivalent of fluxes.

It is seen from these requirements that the limits drawn are closer than those generally considered for No. 2 fire clays. However, it is believed that with these restrictions this class of refractories would become more generally useful in industrial application.

N. P. B. M. A. TO MEET IN SEPTEMBER.

The board of directors of the National Paving Brick Manufacturers' Association has decided to hold the next meeting of that body in Cleveland, Ohio, some time during the month of September, the exact date to be announced later. This will be the tenth annual meeting of the association, which heretofore has been held in conjunction with those of the National Brick Manufacturers' Association. The extensive brick plants located about Cleveland and vicinity will be inspected and visitors to the convention will be afforded the opportunity of seeing the transition of the shales and clays into brick, how shipments are made and the delivery of the finished product on the job; also of seeing a large variety of road and city street brick work throughout the northeastern part of the state. Secretary Blair announces that a lengthy program will be rendered and many matters of great interest to the members will be discussed.

INSTALLS WEATHERING SYSTEM.

The Ashland Fire Brick Company, Ashland, Ky., recently had installed at its plant a clay storage and weathering system. The company had found it necessary to season its clay for several weeks before it could be worked, and the new system will provide an automatic storage and for withdrawing from the pile to the pans. The equipment was furnished by the Stephens-Adamson Mfg. Co., of Aurora, Ill. It would be well for face-brick plants encountering difficulties in securing uniform burns to take up the matter of weathering with the Stephens-Adamson concern.

NEW INVENTION FOR BRICK TIES.

[Consul H. D. Van Sant, Dunfermline, Scotland.] A builder in Dunfermline has recently invented a new type of wall tie. While the tie heretofore in use in this district gripped but two bricks, with the tie invented a half dozen bricks are caught, giving not only additional strength to the wall but requiring fewer ties and a considerable saving in the bricks used in a large building operation. An additional merit claimed for this tie is that it can be seen before the wall is plastered, thus avoiding any dispute about using less bricks than the number specified by the architect. The invention is well spoken of by architects in this city and vicinity.

FACE-BRICK ASSOCIATIONS ADOPT REFORMS.

At a meeting held in the Kaiserhof hotel in Columbus, Ohio, June 17, at which there were present representatives of the American Face Brick Association, the Ohio Face Brick Association and the recently organized Face Brick Dealers' Association, President F. Lawson Moores, of the latter organization, presented a number of cardinal principles which had been formulated by his association and which, it hoped, would be acceptable to the other delegates. Among the measures offered by Mr. Moores were:

1. To promote publicity in the transaction of business.
2. To promote cordial and friendly relations among members.
3. To collect and disseminate accurate information concerning the manufacture and sale of face-brick and other building materials, including correct statistics regarding the capacities and output of all the plants.
4. To maintain high and uniform standards in the manufacture and sale of face-brick.
5. To devise ways and means for promoting the use of face-brick.
6. To correct abuses in traffic problems.
7. To co-operate with customers, manufacturers



F. LAWSON MOORES, PRES. FACE BRICK DEALERS' ASSN.

and each other in the correction of unfair and pernicious practices and customs.

8. To introduce the open policy by bringing into the open all competitive conditions, but allowing any member to quote price as he pleases.

The principles set forth by Mr. Moores were given the hearty endorsement of the representatives.

It is the purpose of the three organizations to originate some sort of trade mark to be placed on each brick sold under the authority of the American Face Brick Association.

The newly formed Face Brick Dealers' Association is composed of many of the most progressive institutions of the country, of whom President F. Lawson, of the Moores-Cooney Company, Cincinnati, Ohio, is a noteworthy example.

The vice-presidents of the organization are A. B. Meyer, of A. B. Meyer Company, Indianapolis; E. F. Knight, of the Buffalo Builders' Supply Company, Buffalo, N. Y.; W. G. Thomas, of Thomas Bros. & Co., Detroit, Mich.; L. W. Gaddis, of Gaddis-Harrison Company, Columbus, Ohio; Herman L. Matz, of the S. S. Kimbell Company, Chicago; F. J. Nixon, of the Paine-Nixon Company, Duluth, Minn.; George Schwartz, of Rickatson & Schwartz, of Milwaukee, Wis. One vice-president from each state represented, to be added later.

R. L. Queisser, of the Queisser-Bliss Company, Cleveland, is secretary-treasurer of the new organization.

The executive committee is composed of A. E. Bradshaw, Indianapolis, Ind.; W. A. Fay, Cleveland, Ohio; F. B. Holmes, Detroit, Mich.; F. Lawson Moores, Cincinnati, Ohio, and R. L. Queisser, Cleveland, Ohio.

The plant of the New Jersey Pottery Company, at Trenton, N. J., was recently destroyed by fire, at a loss of \$50,000. The fire was caused by an overheated kiln.

The Independent Brick Company, Philadelphia, Pa., recently received a contract for over 1,000,000 hard and salmon brick to be used by S. Shoemaker, at his operation at Sixty-first and Catharine streets.

Theodore C. Lundy, of Knoxville, Tenn., died on May 15 after a short illness from Bright's disease. Mr. Lundy had been engaged in the brick business almost during his whole lifetime and was an active member of the National Brick Manufacturers' Association. He was 68 years old and is survived by his widow and four daughters.

T. L. Herbert, a prominent brick manufacturer of Nashville, Tenn., and a charter member of the National Brick Manufacturers' Association, died at his home in that city, the middle part of May. Mr. Herbert was 60 years of age and had been engaged in the brick business since 1877. He is survived by his widow, three sons and three daughters.

L. C. Whittet has sold his brick yards and lumber business at Edgerton, Wis., to Albert Shaller, of Janesville, and Frank Young, of Reedsburg, who will conduct the business under the firm name of Shaller & Young. The main plant at the Whittet brick yards was destroyed by fire recently, with a loss estimated at between \$5,000 and \$6,000. New and modern equipment had only recently been installed in the plant.

Francis Hyde, president of Hyde & Sons, Ltd., a well known builders' supply concern of Montreal, Canada, died at his home a few weeks ago. Mr. Hyde moved to the Canada city from Ireland in the early forties and founded the firm of F. Hyde & Co., which was later known as Hyde & Webster. The holdings of the latter concern was purchased only a few months ago. Mr. Hyde was a member of the National Brick Manufacturers' Association. He leaves a widow, four sons and one daughter.

The Underwood tariff bill (schedule B) which has passed the House and is being considered by the Senate, provides that fire brick, magnesite brick, chrome brick, and brick not specially provided for in this section, not glazed, enameled, painted, vitrified, ornamented, or decorated in any manner, ten per centum ad valorem; if glazed, enameled, painted, vitrified, ornamented, or decorated in any manner, and bath brick fifteen per centum ad valorem.

Elmer O. Simons, secretary-treasurer of the Simons Brick Company, of Los Angeles, and a pioneer in the business of southern California, died June 26, aged 44 years. Mr. Simons had not been actively in business for the last year, owing to ill health. The Simons family came to Los Angeles nearly 30 years ago from Hamburg, Iowa, and built up one of the leading brick industries of southern California. Joseph Simons, his brother, remains in charge of the brick works.

The Wisconsin Crozite Brick Company has been incorporated with a capital stock of \$500,000 by residents of Waukesha, Wis., and Milwaukee, and it is reported that a movement is on the way to have the new concern erect two plants, one to be located in Waukesha and one in Milwaukee. It is said that the Waukesha plant will manufacture about 40,000,000 brick annually, a good portion of which will be shipped to the Milwaukee market, unless a branch plant is erected in Milwaukee. It is reported that the capacity of the Waukesha plant will be in the neighborhood of 300,000 bricks daily.

A consolidation of two of the largest face brick distributors in the East was formed a few days ago. The companies entering the alliance were Fredenburg & Lounsbury, for twenty years active in the face brick business, and Houghtaling & Wittpenn, Mr. Houghtaling joining forces with Fredenburg & Lounsbury and Mr. Wittpenn, who is mayor of Jersey City, N. J., and a candidate for governorship, withdrawing from active business because of his political affiliations. The new consolidation has been incorporated at Albany, N. Y., for \$60,000, effective July 1, and will hereafter be known as Fredenburg, Lounsbury & Houghtaling.



PRODUCTION OF GYPSUM.

The production of crude gypsum reported for 1912 exceeds that of any previous year. The progress of the gypsum industry has been marked, although somewhat irregular. Increased production has not been recorded every year, but the gain made in good years more than offsets the decrease of less prosperous seasons. The number of short tons of raw gypsum mined in 1912 was 2,500,757, an increase of 176,787 tons over the 2,323,970 tons mined in 1911. The gypsum sold without calcining and used principally as land plaster and as an ingredient in Portland cement and in paint, amounting to 441,608 short tons, valued at \$623,522, showed an increase in quantity of 54,128 tons, and in value of \$34,043, as compared with 387,480 short tons, valued at \$589,479 in 1911; and the material calcined for plaster increased in quantity 133,256 short tons and in value \$67,830. The total value of gypsum and gypsum products in 1912 was \$6,563,908, as compared with \$6,462,035 in 1911, an increase of \$101,873.

Gypsum was produced in 17 states and in Alaska. The total number of mills reporting in 1912 was 76. This includes mills using domestic material that calcined plaster as well as those that ground raw gypsum for land plaster and for other purposes. New York state was the largest producer of raw gypsum; Iowa ranked second; Michigan was third. Sales of gypsum products are credited to Georgia, Illinois, Minnesota, Washington and Wisconsin, although these states are not producers. This is rendered necessary by the recent trend of the gypsum industry toward assembling calcined gypsum, retarder, fiber, sand, etc., and preparing plasters for the market at local mixing mills from which they may be more readily and economically distributed to the trade territory. Sales made from mixing plants as reported to the survey are credited to the state in which the warehouse is located.

The raw gypsum ground and sold for land plaster amounted to 53,065 short tons, valued at \$107,058, in 1912, compared with 52,880 tons, valued at \$97,573, in 1911, an increase in quantity of 185 short tons and in value of \$9,485. The average price per ton at the mills received for land plaster was reported to be \$2.02 in 1912, compared with \$1.85 in 1911, and \$2.05 in 1910. The raw gypsum sold for the manufacture of paint, Portland cement, for bedding plate glass, and various other purposes, amounted to 388,543 short tons, valued at \$516,464, in 1912, compared with 334,600 short tons, valued at \$491,906, in 1911, an increase in quantity of 53,943 tons and in value of \$24,558. The average price of this class of products in 1912 was \$1.33 per ton, compared with \$1.47 in 1911, and \$1.52 in 1910. The average price of calcined gypsum products, including wall plasters, plaster of Paris, Keenes cement, dental plaster, etc., was \$3.43 per ton, compared with \$3.67 in 1911, and \$3.70 in 1910.

LOUISVILLE PLASTER NEWS.

Louisville, Ky., July 19.—Wall plaster demand, both in city and state, seems to be improving, and most of the local plants are working steadily and finding a ready market for their output. While building conditions have not been highly favorable for the past couple of months, the situation seems to be returning to normal and August and September seem likely to provide a strong finish to the year. Wall plaster men are winding up much work and beginning on other which seems to insure activity for the remainder of the season. Business has been good enough to cause the wall plaster contingent to give up any ideas which might have been entertained regarding vacations, and members of the trade will stay at home and make hay while the sun shines.

The Southern Wall Plaster Company, though it has given up the big Young Men's Christian Association contract, is still in the field and efforts are being made to have the company continue business. The company is going after other contracts of somewhat less importance, and may weather its financial storm yet.

Fire in the basement of the Passaic River Plaster Board Company, Passaic, N. J., did several thousand dollars' damage recently.

Chicago Ornamental Cement & Plaster Company, Chicago; \$2,500; manufacturing, buy and sell articles of cement, plaster, etc. Joseph G. Sheldon, William M. Lawton, Fred B. Silsbee.

San Francisco, Cal., July 12.—Floodberg & McCaffery, of San Francisco, have two contracts on the fine residence of Chas. T. Crocker at Hillsborough, Cal. The interior plastering comes to \$26,000, and the exterior cement work to \$25,000.

C. C. Morehouse has the plastering contract for the J. B. Lankershim hotel, a 7-story concrete building at Fifth and Jessie streets, San Francisco, at \$34,139.

The Beaver Company, Ltd., of the Canadian Beaver Companies, has already broken ground at Thorold, Ontario, for the erection of a large modern plant for the manufacture of "Beaver Board." Power from Niagara Falls will be used and a contract has just been closed for the first unit of 2,800 horsepower, to be run continually night and day for thirty years. Later machinery will be installed which will require nearly 6,000 horsepower in addition to 500 horsepower which will be generated in the boilers for the treatment of fiber.

MAY REBUILD PLASTER PLANT RECENTLY BURNED.

The plant of the Consolidated Wheatland Plaster Company, Wheatland Center, N. Y., which was destroyed by fire a few weeks ago, is soon to be rebuilt, according to the directors, who reside in Caledonia, N. Y. The fire, which, it was eventually found, caused a loss of about \$40,000, destroyed or rendered useless practically all of the machinery used in the manufacture of stucco wall plaster, which was the principal product of the plant.

The greater part of the machinery was practically new and the company proposes to replace it with the best machinery to be had for the manufacture of the wall plaster. The plant was working as rapidly as possible in order to catch up with the orders, which were at the time of the fire some forty carloads behind.

The company has at the present time an option on the plant of the Rochester Pulp Plaster Company, situated about a quarter of a mile from the mines, and may purchase this structure and move to the mines, as it would take less time than to build a new plant. The company has another alternative, as it owns seven acres of fine gravel and there is a sandpit near the mines; it would therefore be easy to erect a plant of concrete. The operations in the mine have ceased for the present.

Production of gypsum in the United States in 1911 and 1912, by States and uses, in short tons.

1911.

States.	Number of mills reporting.	Total mined.	Sold without calcining.				Sold as calcined plaster.		Total value.
			Ground for land plaster.		For Portland cement, paint, bedding, plate glass, and other purposes.		Quantity.	Value.	
			Quantity.	Value.	Quantity.	Value.			
Alaska, Arizona, Georgia, ^a Illinois, ^a Minnesota, ^a Missouri, ^a Montana, New Mexico, South Dakota, Washington, ^a and Wisconsin ^a	8	129,193	382	\$1,374	13,537	\$43,672	151,376	\$784,164	\$829,210
California.....	6	43,855	7,399	18,280	15,726	42,193	25,144	143,791	204,264
Colorado.....	4	26,226			(b)	(b)	c 22,099	c 67,199	67,199
Iowa.....	6	354,204	(d)	(d)	e 11,032	e 14,465	229,890	857,287	871,752
Kansas.....	6	122,579	(d)	(d)	e 33,278	e 30,768	47,765	70,795	319,504
Michigan.....	8	347,296	15,548	15,706	63,502	69,549	206,299	488,671	573,926
Nevada and Utah.....	6	133,960	(d)	(d)	e 17,550	e 25,329	98,419	413,463	438,792
New York.....	12	472,834	7,960	17,426	149,722	213,903	268,785	968,267	1,199,596
Ohio and Virginia.....	5	360,858	11,962	26,832	21,166	41,880	283,672	987,856	1,056,568
Oklahoma.....	10	108,653	(d)	(d)	e 11,553	e 15,316	75,081	277,986	293,302
Texas.....	4	179,625	(b)	(b)	(b)	(b)	c 143,281	c 491,685	491,685
Wyoming.....	3	44,687					30,740	116,237	116,237
Total.....	78	2,323,970	52,880	97,573	334,600	491,906	1,598,418	5,872,556	6,462,035

1912.

Alaska, Arizona, Colorado, Georgia, ^a Illinois, ^a Minnesota, ^a Montana, New Mexico, South Dakota, Utah, Virginia, Washington, ^a and Wisconsin ^a	15	302,029	15,556	\$40,995	46,902	\$103,444	266,209	\$1,170,136	\$1,314,575
California.....	6	47,741	7,055	17,835	13,011	32,787	30,457	168,695	219,317
Iowa.....	6	411,186	(d)	(d)	42,443	40,824	273,116	804,804	845,628
Kansas.....	6	131,031	(d)	(d)	29,356	25,341	80,002	299,479	324,820
Michigan.....	8	384,297	10,103	9,375	53,716	52,470	243,656	559,702	621,547
Nevada.....	4	122,408	(d)	(d)	15,500	15,600	91,355	453,330	468,930
New York.....	12	506,996	10,498	23,248	170,448	224,704	274,155	993,562	1,241,514
Ohio.....	4	262,551	(d)	(d)	6,769	12,478	237,094	799,910	812,388
Oklahoma.....	8	135,074	(d)	(d)	17,334	20,904	86,741	247,714	268,618
Texas.....	4	160,863	(b)	(b)	(b)	(b)	131,033	356,579	356,579
Wyoming.....	3	36,581	(d)	(d)	(d)	(d)	26,773	89,992	89,992
Total.....	76	2,500,757	53,065	107,058	388,543	516,464	1,731,674	5,940,386	6,563,908

^a Produces no crude gypsum.

^b Included with calcined gypsum.

^c Includes some crude gypsum.

^d Included with crude gypsum for Portland cement, etc.

^e Includes some land plaster.

SAND~LIME † † †
† † † † † **BRICK** †

SAND-LIME BRICK ASSOCIATION.

(Meets Annually.)

Officers.

President—S. O. Goho, Harrisburg, Pa.
Vice-President—F. B. Allen, Toronto, Ont.
Secretary—W. E. Plummer, Jr., Buffalo,
N. Y.

Treasurer—J. L. Jackson, Saginaw, Mich.

Executive Committee.

Canadian Division—G. Silvester, Calgary, Alta.

Western Division—E. G. Chapman, Minneapolis, Minn.

Eastern Division—W. M. Burchfield, Rochester, N. Y.

Southern Division—H. H. Tift, Tifton, Ga.

Central Division—W. L. Penfield, Willoughby, Ohio.

Intent upon choosing a residence with a hard-to-pronounce name, C. E. Carlson, late of Schenectady, N. Y., has moved to Saskatchewan. He will operate the sand-lime plant of the Sand Stone Brick Company at Prince Albert, Sask., and it is expected that, under his direction, the output of that plant will be greatly increased and improved.

D. H. Walker, Jr., has taken the position of manager of the Golden Gate Brick Company, replacing C. F. Pratt, who recently resigned. The office remains at 660 Market street, San Francisco, Cal., and the company is doing a good business with a fine grade of sand-lime brick made at Antioch, Cal., as well as with several lines of clay products.

MANUFACTURES BRICK FROM SLAG.

At Sydney, Nova Scotia, there is a plant manufacturing pressed building brick from slag. It is of special interest as it is the only plant in America, it is claimed, that uses this material for the purpose. The brick are made from basic blast furnace slag, a by-product of the Dominion Iron & Steel Company's blast furnaces. This slag is said to be admirably adapted for the purpose, containing as it does, about 50 per cent lime, 30 per cent silica and 13 per cent of alumina and ferric oxide. The molten slag is brought in contact with water and is thereby granulated and brought to a condition appearing like coarse sand. This water-granulated slag goes through a special preparation when a small percentage of cement is added, and is treated in a manner similar to the process of making sand-lime brick. The result is a pressed brick which is like an artificial stone.

The machinery of the Golden Gate Company's sand and sand-lime brick plant at Antioch, Cal., being overhauled, the Santa Fe Railroad is putting in a switch for the plant, and shipments of sand will soon be commenced on a large scale. The sand-lime brick plant, which has been closed for a time, will also be started up shortly. This company has taken a contract to supply about 100,000 square feet of partition tile for the National Guard armory in San Francisco.

M. T. Hayes & Co., Singer building, New York City, are handlers of slightly-used machinery on a large scale. The facilities of the concern render it possible to make shipments of almost any kind of high-grade machinery used in cement mills without loss of time. The line handled by the Hayes company includes steam shovels, drills, stone crushers, compressors, tube mills, conveyors, pulverizers, ball mills, kilns, grinders, motors, dryers, elevators, cars, dinkies, cranes, bins, hoisting engines and other machines too numerous to mention.

The machinery is sold subject to Hunt's or the Pittsburgh Testing Laboratory inspection, should it be inconvenient for the purchaser to personally inspect it.

The company also makes a specialty of selling machinery on commission for those having equipment on hand not in use.

An efficient engineering department is maintained by the M. T. Hayes & Co., and plans and estimates will be cheerfully submitted upon request.

The company has machinery located in all parts of the United States and Canada.

TRUS-CON LABORATORIES SPECIALISTS

This is the age of specialists. Each man to his own work is the spirit and need of the times. The staff of the Trus-Con Laboratories, Detroit, Mich., is made up of specialists—skilled construction and chemical engineers with years of practice in their respective lines. In their daily work these men are brought face to face with waterproofing and dampproofing problems. They do not go about the solving of these problems in a hit-or-miss manner, but thoroughly analyze the causes and then formulate methods to overcome same.

Every Trus-Con Laboratories product has not only been carefully worked out in the laboratories, but has stood the actual test of severe and trying service. The Trus-Con Laboratories do not manufacture a general cure-all product. Each of its more than twenty products is made for a particular purpose and will accomplish all that is claimed for it if directions and specifications are followed.

The Trus-Con Laboratories is a technical organization and offers the service of a strong engineering staff to anyone wishing to consult them on a waterproofing, dampproofing or painting problem. Write them in detail, covering every phase of your operation and you will receive a detailed reply. This service is offered without cost and should be used by engineers, architects, contractors, builders and the general public interested in building.

The Edgar Allen American Manganese Steel Company has just issued Bulletin No. 52 dealing with "Komata Liners for Tube Mills," also a booklet on "Electric Special Ground Gears and Pinions." These are for general distribution to the trade and may be secured by addressing the company at its Chicago office.

The new Equitable Life Insurance building in New York, 38 stories high, will contain approximately 36,000 tons of structural steel, the inspection of which, both mill and shop, has been intrusted to Robert W. Hunt & Co.

"NESTOR"

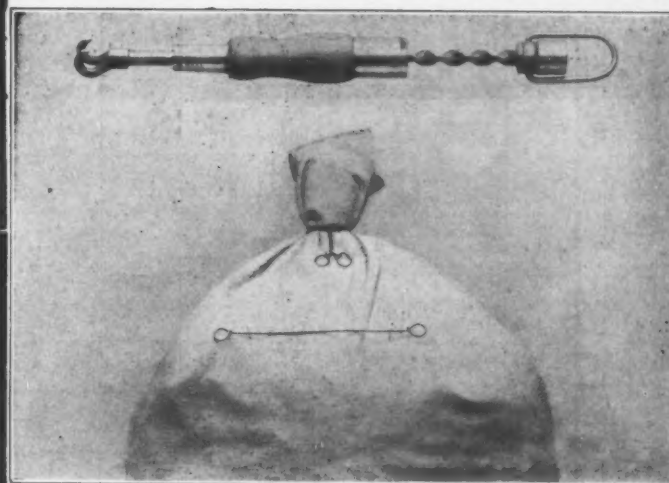
SOLID WOVEN WATER PROOF BELTING

**BUILT ESPECIALLY
FOR**

Sand and Gravel Plants

Write for Catalog Just Off the Press
Kindly Mention This Paper

THE AMERICAN FABRIC BELTING CO.
CLEVELAND, OHIO



THE CURRY BAG TYER

It has proven in hundreds of cement, plaster, lime, and other bagging concerns, for over three years, that its security and efficiency are far greater than any possible use of twine.

Test it without cost.

Catalog E and Prices

J. P. CURRY MFG. CO., Inc. 110 East 23rd St.
NEW YORK CITY
(Formerly Curry Bag Tye Dept. of Clifford L. Miller & Co.)
We have begun suit against the maker and seller of a similar tool and are prepared to enforce our rights against all infringements.

Tell 'em you saw it in ROCK PRODUCTS

"Worthington Volute Centrifugal Pumps" is the title of a catalogue just issued by Henry R. Worthington, 115 Broadway, New York City. Worthington turbine pumps are described in another catalogue which the company will be pleased to mail upon request. The catalogue is amply illustrated and describes the three designs of the volute pumps—the single side suction type, the double suction solid case type and the double suction pump with horizontally split casing.

A neat little booklet has been gotten out by the A. S. Cameron Steam Pump Works, foot of East Twenty-third street, New York City. It is not attempted in the pamphlet to do more than present a few of the many designs of pumps built by the

company, but is presented with the idea of having it serve as an introduction or preliminary to more extended information which the Cameron concern will gladly supply. A number of illustrations of pumps and parts are shown, also directions for setting up and running pumps, as well as a brief description of the Cameron steam end, water valve check, etc.

Ingersoll-Rand Company, 11 Broadway, New York City, has issued under date of May, 1913, a pamphlet dealing with deep hole drill wagons. The field of this type of drilling rig will be found in the economical excavation of rock in quarries, railroad cuts, canals and work of a similar nature. A brief description of the manner of handling and

methods of drilling with the turntable rigs is contained in the booklet, and information pertaining to the portable wagon for a single drill and for three or more drills is given, with the proper illustrations. The six-foot feed electric-air turntable drill wagon and other subjects are also described and treated.

United States Gypsum Company, Chicago, Ill. 6" x 4", paper bound, 14 pp., illus. Modern construction efficiency calls for high degree of development in all building materials which are needed. This booklet presents the claims of gypsum materials as hard wall plasters. Photographs are shown of many modern buildings in which this material has been used.

CLASSIFIED ADVERTISEMENTS

Advertisements will be inserted in this section at the following rates:

For one insertion..... 25 cents a line
For two insertions..... 45 cents a line
For three insertions..... 60 cents a line
Eight words of ordinary length make one line.
Heading counts as two lines.

No display except the headings can be admitted.

Remittances should accompany the order. No extra charges for copy of paper containing the advertisement.

EMPLOYEES WANTED

Wanted—A practical building material salesman or manager to head this department, take care of correspondence on plaster, lime, cement, face brick, etc. Main office Indianapolis. Permanent position waiting. Give full particulars of self. Answers treated confidential. Answer. Box 935, care Rock Products.

CEMENT FINISHER WANTED.

Wanted at once, a first class cement finisher. J. G. HARDING, Lock Box 652, Williston, N. D.

WANTED—SUPERINTENDENT for large cement mill. Must be familiar with making of Portland cement from limestone and clay. Address, A. B. care Rock Products, stating past experience, references and salary expected. All communications confidential.

EMPLOYMENT WANTED

Experienced young crushed stone expert of good address wants position as manager or superintendent of larger plant. I can get results. Let me put your plant on a paying basis which my varied experience enables me to do, very readily. Address Box 939, care Rock Products.

Wanted—Position as superintendent of large lime and quarry plant. Long experience. Best references. Address Expert, care Rock Products.

SITUATION WANTED as superintendent. Many years' experience as stone man with both stone-pickers and steam shovel. Prefer quarry with large tonnage. Address, "Stone Expert," care Rock Products.

MILLIONS

Can Be Made by the Purchase of an Austrian Invention of

Artificial Marble

Hardy against frost and weather; no Gypsum-Marble. Price for America \$300,000. Inquiries to be addressed "Kunstmarmor" P. F. 2546 to Rudolf Mosse, Prag, Graben 6, Bohemia.

W. J. LEWIS & CO.

Consulting Geologists

Quarry Projects and Management a Specialty.
Exploration Reports—Estimation Reports.
Economic and Efficient Operation Reports.

1312 First National Bank Building, Chicago

WANTED—Position as quarry superintendent or erecting crusher plant. Fifteen years' experience in all around quarrying operations and maintaining plant. Address Box 944, care Rock Products.

WANTED—Position as superintendent of quarry. Thoroughly familiar with "big blast shots." Fourteen years' experience. Address Live Wire, care Rock Products.

POSITION AS SUPERINTENDENT.

Position wanted as superintendent of lime works, by a hustler of fifteen years' experience, capable of taking full charge of plant, including quarry, and can be depended on at all times to keep things up to the minute and in working order. Can furnish best of references from former employers and produce results. I am thoroughly familiar with Gas Producer and direct fire kilns. Also Hydrate Mill and Stone Crusher. Address Results, care Rock Products.

WANTED—Position as superintendent crushed stone plant. Fifteen years' experience and thoroughly acquainted with all departments of the business. My capabilities and experience are such that I can assume all responsibilities connected with the operation of your plant and guarantee satisfactory results. Am now holding a good position but wish to make a change. Address Box 943, care Rock Products.

PLANT FOR SALE

FOR SALE OR LEASE.

60 Acre tract limestone, with completely equipped crushed stone plant, 500 tons capacity; lime kilns, store and tenement houses. Excellent demand for output. Located on main line of a good railroad in Tennessee. Address Box 929, care Rock Products.

FOR SALE.

LIME AND STONE CRUSHING PLANT—Six kilns, capacity 60 tons; two crushers, capacity 250 tons; established 20 years, fully equipped and machinery in good condition, a going business; 37 acres inexhaustible deposit 95% calcium limestone, large bodies yellow bank sand, and U. S. Government approved brick clay. Millions appropriated by state for good roads. Excellent railroad rates and connections. Located on B. & O. R. R. Output sold in six states. No trouble to make money. Will sell outright or take active partner. For particulars Address Box 127, Frederick, Md.

For Sale—Complete crushing plant and machinery, in good condition, capable of producing 700 tons crushed stone per day, with 13 acres of available stone, with 40 foot face adjoining. Located near Olympia Mills, Columbia, S. C. Good chance for man who knows the business. For particulars address Carolina Portland Cement Company, Charleston, S. C.

BUSINESS OPPORTUNITIES

FOR SALE OR LEASE.

40 acres of clay deposit in northern Minnesota, suitable for brick or building tile. Good markets. F. Sabrean, 8 Edison Bldg., Duluth, Minn.

BLACKSMITHS—Here is your opportunity to be an expert blacksmith without help as life is short. Try Toy's Modern Methods doing hard jobs easy. Forging and welding all kinds of steel solid, and tempering and hardening all tools to a standard by colored charts. This is real information, not theory. All for one dollar.

ALSO

VALUABLE FERTILIZER FACTS for Lime Manufacturers, enabling you to sell your lime either Magneslan or Calcium to greater advantage. You can use these in your adverbs to great advantage. My price for these facts and formulas is \$5.00. SPECIAL, will send Modern Methods in Blacksmithing & Fertilizer Facts for \$5.00. Address R. M. GLACKEN, Chemist, Baltimore, Md.

FOR SALE—Twenty-five acres of building sand. Will sell all or part of my interest in same. An excellent investment for a man with capital. Adjoining Southern Railroad Company's tracks. Address W. J. MARTIN, Saulsbury, Tenn.

G. P. GRIMSLEY, Ph. D.

MINING AND CONSULTING GEOLOGIST

Formerly Asst. State Geologist W. Va.; Formerly Geologist on Ohio, Michigan and Kansas Geological Surveys; Ex-Manager National Limestone Company. Consulting Geologist National Limestone Company.

Examination, Reports, Consultation on development Limestone, Clay, Gypsum and Coal.

Room 1105 Wyandotte Bldg. : Columbus, Ohio

WANTED—One or two partners in the concrete products business—have a well-established plant here. Address P. O. Box 683, Billings, Mont.

I have a large tract of sand land for sale. Finest proposition in the world. Can be loaded by gravity. Address T. J. Nertney, Ottawa, Ill.

PATENTS

Patents—Patents and trade-marks secured. Inventions examined. Patents investigated. Patent litigation. A. S. Pattison, 100 Barrister Bldg., Washington, D. C.

MACHINERY FOR SALE

FOR SALE—One Ohio Post Mold, makes 12 posts at a time. Good as new. Cost \$40.00; sells for \$25.00. One 6 brick machine for \$15.00. One 10-horse boiler, good condition, steam gauge injector, all complete \$20.00. One Dean Steam Pump, 2 by 1½-inch discharge, \$20.00, using all the time. Address O. L. RIFNER, Spiceland, Ind.

FOR SALE.

Four-36" Vertical Sturtevant Emery Mills with extra stones. Will sell at a bargain. Write KELLY PLASTER Co., Sandusky, Ohio.

FOR SALE—Two new 10 cu. ft. United concrete mixers, complete, with Duke steam engine and tipping engine. Bargain. Address THE STANDARD MACHINERY CO., Mystic Conn.

FOR SALE—One No. 7 Sullivan Channeller. Complete with boiler. Slightly used but as good as new. Price right. Address KING'S CREEK QUARRY COMPANY, R. F. D. No. 5, New Cumberland, W. Va.

For Sale—Four steel tanks or bins, 14 feet in diameter, 40 feet high. Also boilers, engines, pumps, etc. All suitable for anyone intending to build gravel washer. All will be sold cheap because of expiration of lease on plot. Address Garden City Sand Company, Chamber of Commerce, Chicago, Ill.

124 different size culvert forms outfit for \$100. Good as new. Manufacturers charge \$2,000 for same capacity. Write quick. Harry Frick, Line Lexington, Pa.

FOR SALE CHEAP

TWO RAILROAD TRACK SCALES.

with automatic weighing devices. In good condition. Can be used as single or double track scales. Address Pinner Coal Company, Nashville, Tenn.

FOR SALE—BARGAIN

1-110 ton 3½ yard Steam Shovel.
1-12 ton 3-wheel Steam Roller.
4-150 H. P. Boilers, complete with breeching to 90 ft. stack.
1-¾ yard Koehring Traction Mixer.
2 No. 8 Crusher Plants, complete with engines, boilers, compressors.
1-65 ft. private car, complete.

DOLESE & SHEPARD CO., CHICAGO, ILL.

CULVERTS
CONCRETE
CULVERT FORM (Steel)
ADJUSTABLE 15 SIZES \$47
CATALOGUE FREE
FRANCIS MACHINERY CO., 4 Market St., St. Louis, Mo.

Ferguson & Lange Foundry Co.

—CHICAGO—

Specialists in Hard Iron and Chilled Castings—Brick Yard Rolls—Hard Liners, etc. Gray Iron Castings, all kinds. Small Car Wheels.

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30-1½ yd. End Dump Cars, 30 in. gauge, practically new, each \$30.00.

Gates No. 2 Gyrotory Crusher, "D"—shop No. 6015—r. h. d. two arm spider—manganese head and concave. \$300
Gates No. 5 Crusher; two arm spider, rear drive (rebuilt B)—low price.

Heyward one yard clam shell bucket, \$300.

Also cableway hoists, screens, dinky locomotives, shovels, relaying rails, etc.

Willis Shaw Mach. Co.
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FOR SALE CHEAP**Two-Yard Concrete Mixer**

"Hadsel" concrete mixer with engine, mounted on channels, in excellent condition.

Also one ½-yard engine and boiler, same make. Several ½-yard Ransome Mixers. All ready for service.

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168 South Street New York City

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For Sale—One Ing.-Ser. Class G2 Duplex Steam and Cross Compound Air. Size 12 x 11½ and 18½ x 14. Capacity, 638 ft. to 100 lbs. air pressure. Code name "Georgiana." Little used, fine condition; immediate shipment, must move; low price.

If you need Hoists, Cars, Derricks, Pumps, Locomotive Cranes, Steam Shovels, etc., confer with me.

WILLIS SHAW
1216 PEOPLES GAS BLDG. CHICAGO, ILL.

**Reasons Why ARCHITECTS Can Specify CALVERT MORTAR COLORS****BECAUSE**

They give an Artistic Finish and Neatness, bringing forth most favorable comment

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The Kind You Will Eventually Buy

SOLD TO DEALERS ONLY

Anchor Brand Colors

**For Mortar, Cement and Brick
Brown, Black, Red and Buff
Strongest and Most Durable**

Manufactured by **C. K. Williams & Co.**
Correspondence Solicited Easton, Pa., U. S. A.

Shearer & Mayer Drag-line Cableway Excavator

adapted for digging, conveying and elevating material from wet or dry pits.

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ENGINEERS
and AGENTS

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Cabot's Building Specialties

Cresote Stains for Shingles, Siding, Clapboards, Trimmings, Boards, and all other Exterior Woodwork.

Waterproof Cement and Brick Stains for waterproofing and artistically coloring cement and brick buildings.

"Quilt" for lining houses to keep out cold or heat, for sound-deadening in floors and partitions, and for insulating cold storage and refrigerators.

Conserve Wood Preservative for preserving Posts, Planks, Sills and all other exposed timbers. Mortar Colors, Protective Paints for Metals, Waterproofing Compounds, etc.

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FOR

Cement and Lime Plants

Many valuable Cement and Limestone deposits adjacent to good transportation facilities, near to cheap fuel and where labor is plentiful are offered in several of the Southeastern states along the

Southern Railway System

The local demand for agricultural Lime and the rapid advancement of concrete construction in the Southeastern states have created excellent markets for the output of many plants.

Our free services are at your command in aiding you find a favorable location.

M. V. RICHARDS, Land and Industrial Agt.
Room 371, Southern Railway
WASHINGTON, D. C.

MARTIN STONE CRUSHER AND GRINDER

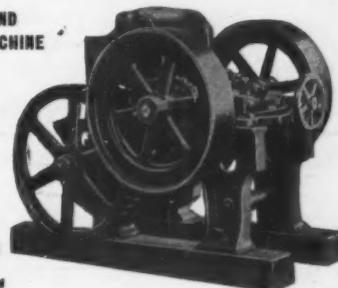
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IN 4
SIZES

IS A SAND
MAKING MACHINE

Maximum
Capacity
25 tons
Daily

Net Price

\$135



No. 2 Receiving Opening 12x5 inches
Weight 1,800 lbs. 3 Horse Power

Guaranteed and sent on ten days' working trial, **send in your Order** and pay after you have tried it out.

Limestone, Lime, Fieldstone, Flint, Marble, Granite, Sandstone, Oyster shells, Rock, Etc., can be reduced at one operation to the fineness of sand, or to ½", ¾", 1" or 1½" for roads, concrete materials and fertilizing purposes.

H. MARTIN BRICK MACHINE MFG. CO.
Lancaster, Pa., U. S. A.

Crushers built in larger sizes also

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CLINTON METALLIC PAINT CO.
CLINTON, N. Y.

LARGEST AND OLDEST MANUFACTURERS OF

BRICK AND MORTAR COLORING

Be sure you get the genuine with the "Little Yellow Side Label" on each package

Let us tell you about Side-Walk Black.

PERFECTION IN BLOCK MAKING

If you wish to attain this you should combine these three important features:

Wet Process, Face Down, Damp Curing.

The PETTYJOHN INVINCIBLE Machine does this, and is the only machine that does. Tandem Invincible makes two blocks at once. Price \$65.00 and up. Single Invincible, \$35.00 and up. With our Triple Tier Racking System green blocks can be stacked three high direct from machine with inexpensive home-made rigging. Plans and blue prints free to customers. It economizes space, reduces off-bearing distance and above all insures slow, even, damp and perfect curing and bleaching.

Write for our latest edition of "Stone Making," a book of valuable data, just off the press—FREE.

THE PETTYJOHN COMPANY

614 North Sixth Street.

Terre Haute, Indiana.

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What you want is belting that will give you your money's worth in absolutely dependable service.

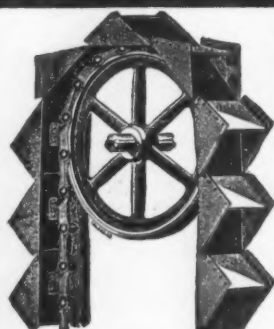
It will take about two minutes of your time to write our nearest house for straight-forward facts that prove conclusively the unusual service value of Leviathan Belting.



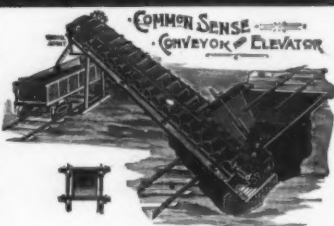
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MAIN BELTING CO. OF CANADA, Ltd.
Montreal Toronto



Send for Catalog 25



THE GENERAL CRUSHED
STONE CO.,

So. Bethlehem, Pennsylvania,

have been using one of our Common Sense Elevators for six years—
capacity 400 tons an hour.

THE C. O. BARTLETT & SNOW CO. CLEVELAND OHIO



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Ricketson's Mineral COLORS

are acknowledged to be the best choice for *everybody*. Best for the architect because purest. Best for the contractor because they go farther. Best for the owner because they never change their color.

For Mortar, Brick, Cement, Stone, Etc.
Red, Brown, Buff, Purple and Black

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The Strongest and
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Our Metallic Paints and Mortar Colors are unsurpassed in strength, fineness, and body, durability, covering power and permanency of color. Write for samples and quotations.

CHATTANOOGA PAINT CO.

Chattanooga, Tennessee

Gravel Washing Plant Owners

have reasons for buying our latest washing screens, as shown below.

Some Reasons Why

BECAUSE all the screens are driven by a single pair of gears, which reduces the power and dispenses with all the chain drives.

BECAUSE the large end of the screens do the principle work, and as the large ends have greater wearing surface and more perforations, the screens last longer and are more efficient.

BECAUSE gravel producers who have had experience are buying our screens in preference to all others.

BECAUSE we have furnished these screens in practically all the gravel producing states in the country, this spring, Illinois, Iowa, Wisconsin, Minnesota, Montana, Michigan, Indiana, Tennessee, Georgia, Texas, Ohio and Pennsylvania.

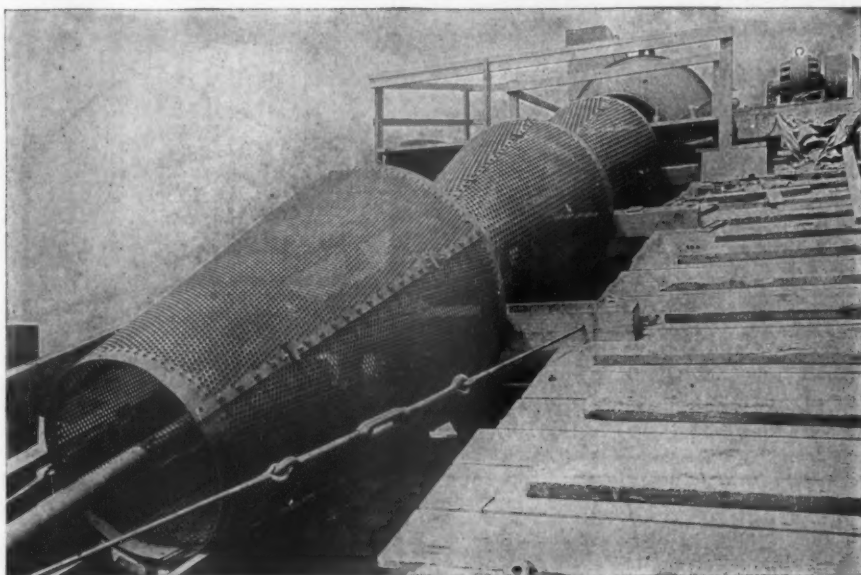
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The Raymond W. Dull Company

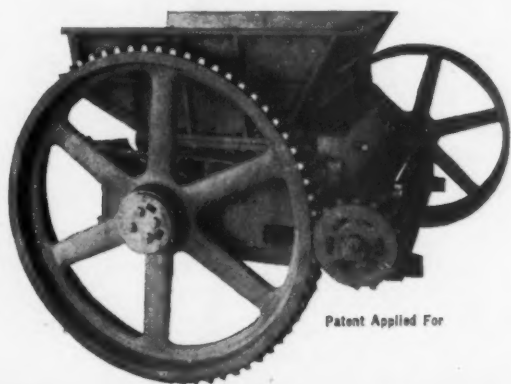
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Chicago, Illinois

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SINGLE ROLL CRUSHERS

For Limestone, Phosphate Rock and Cinder, etc. Any Capacity from 5 to 500 Tons per Hour. More Easily Fed, Makes Less Fines than Either a Jaw or Gyratory Crusher. Information and Prices for the asking.

McLANAHAN-STONE MACHINE CO., Hollidaysburg, Pa.

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A PERFECT STEAM SHOVEL CHAIN

"HERCULES SOLID WELD"

EVERY LINK AS STRONG AS THE SOLID BAR

Cannot come apart at welds. Made from tough high grade hammered iron. The chain that lasts until entirely worn out. No delays from broken chain. It is a marvel in rock work.

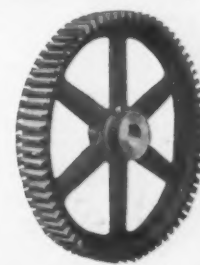
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THE COLUMBUS CHAIN COMPANY

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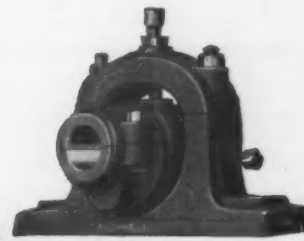
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On the PANAMA CANAL 80%
On the CATSKILL AQUEDUCT .. 75%
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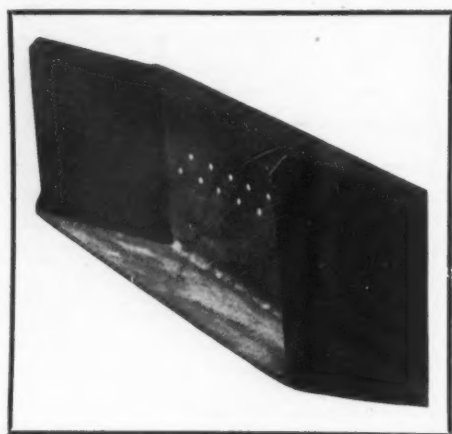
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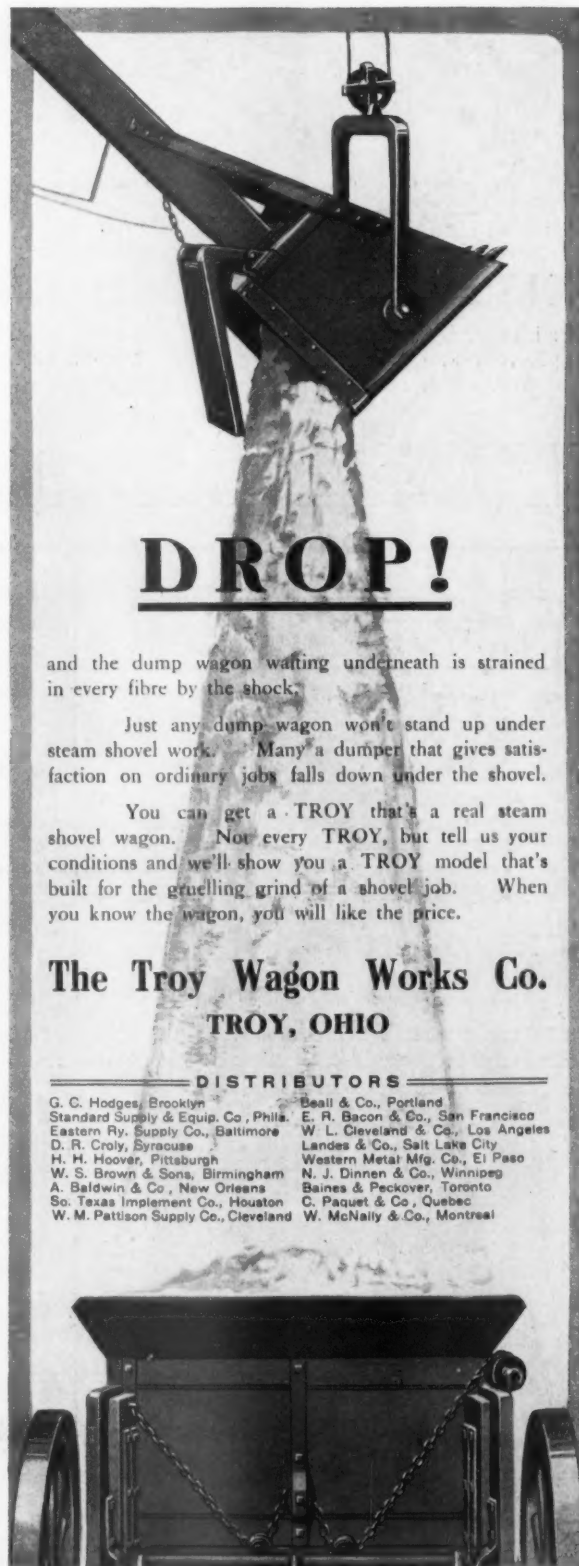
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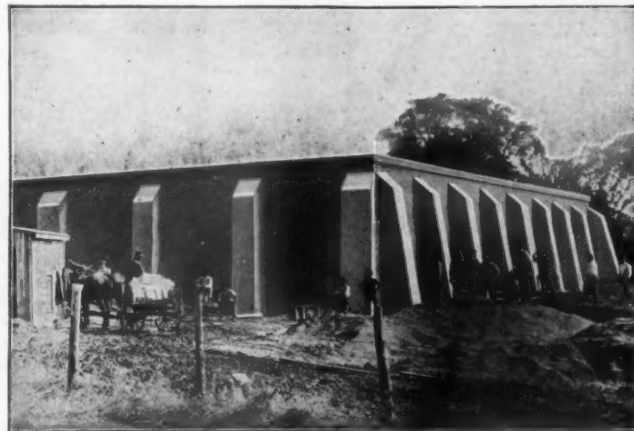
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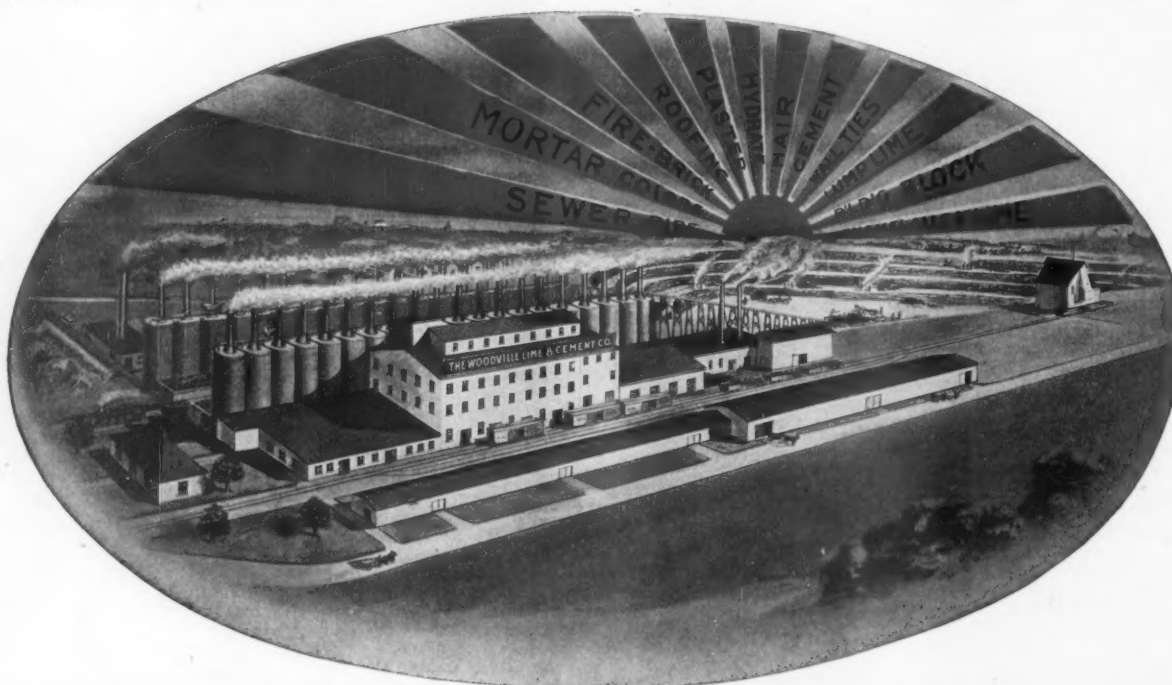
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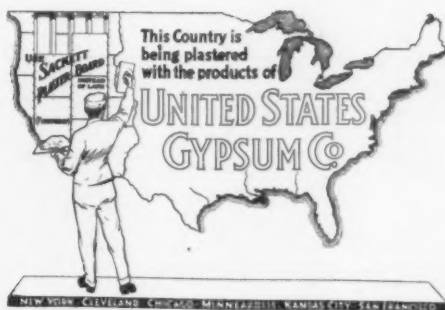
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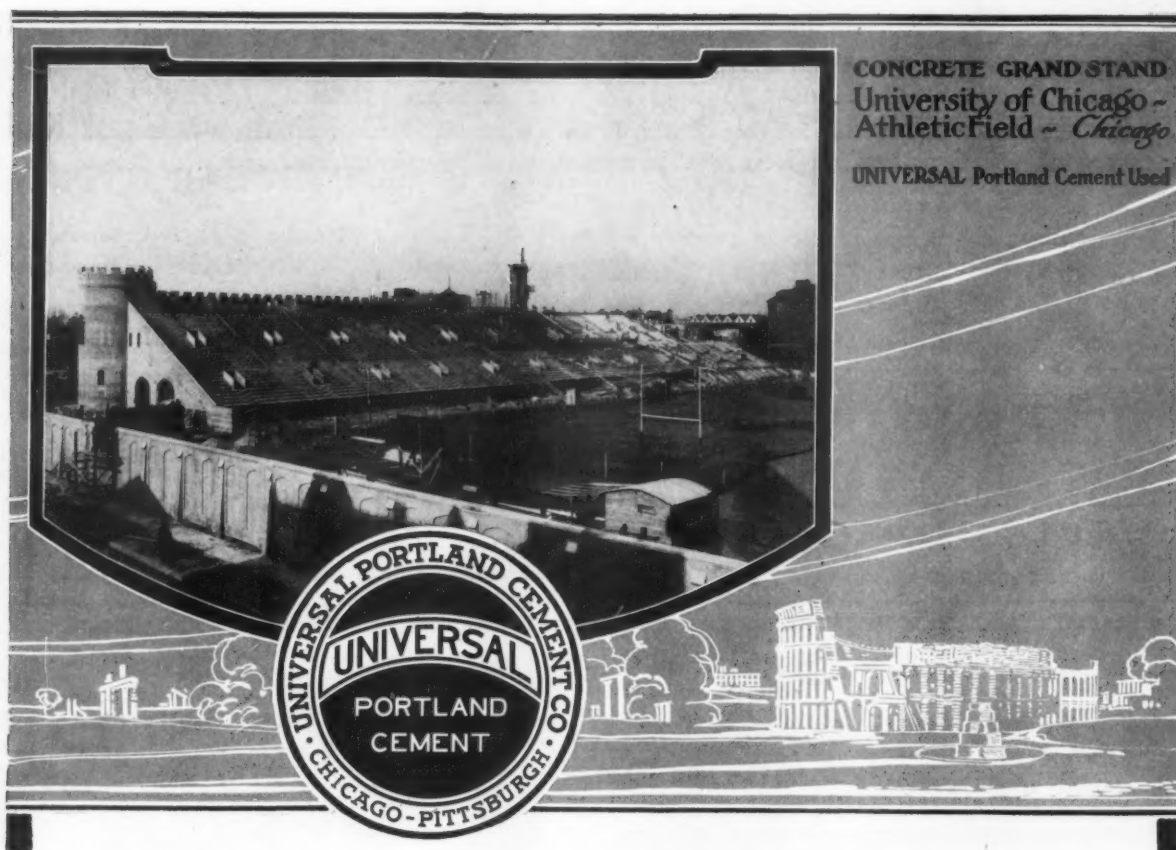
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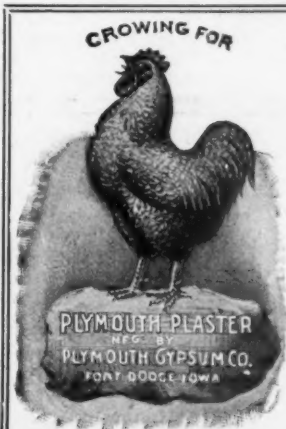
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CONCRETE BUILDINGS are permanent.

There are unlimited possibilities in CONCRETE construction.

Anything that can be built can be built better of CONCRETE.

PORTLAND CEMENT is the 20th Century building material.

Marquette Portland Cement
made from rock sets a higher standard



Sound - Strong - Uniform

Marquette Cement Mfg. Co.
Marquette Building CHICAGO, ILL.

IMPORTANT Advertisers—Take Notice

Changes of Copy

Must be in this office by the Thirteenth of the month, if proofs are desired, if no proofs are required the desired changes can be made if copy is received by noon of the Seventeenth.

New Advertisements

To insure proper classification, should be in this office by the Fifteenth of the month, but they can be inserted in the last form going to press if received by the Nineteenth. The punctual publication of the paper admits no deviation from these rules. Advertisers are earnestly requested to co-operate with us.

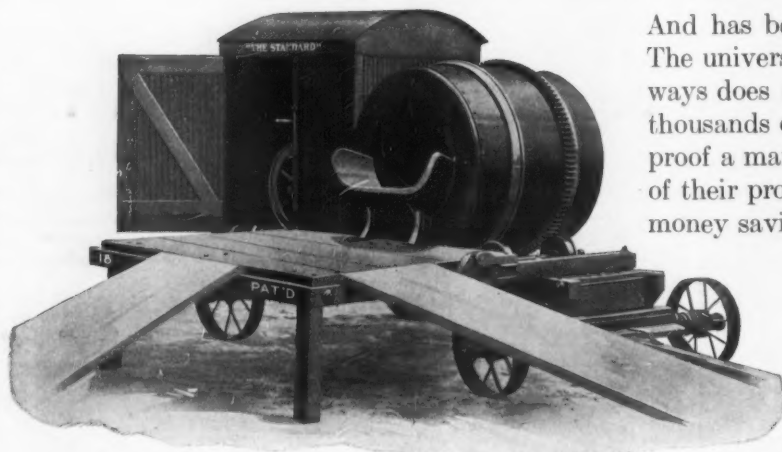
The Francis Publishing Company
537 South Dearborn Street, Chicago, Ill.

Tell 'em you saw it in ROCK PRODUCTS

Again We Repeat That "The STANDARD"

Is not an experiment, nor is it a has-been, but it is

"A Proven Standard"



And has been such ever since the first machine was built. The universal verdict is that "The STANDARD" Mixer always does more than the manufacturers claim for it. The thousands of satisfied users all over the world is the biggest proof a manufacturer can offer for the success and popularity of their product. Low charging is the greatest of time and money saving features ever offered to the modern contractor.

Our new catalog No. 33 contains new and valuable information. Sent upon request.

*Don't Forget That We Are the Supply House
of the World for Contractors' Supplies*

The Standard Scale & Supply Company

Manufacturers High Grade Contractors, Machinery and Supplies

CHICAGO
1345-1347 Wabash Avenue

PITTSBURGH
243-245 Water Street

PHILADELPHIA
35 South Fourth Street

NEW YORK
136 West Broadway

ATTENTION!

CEMENT MILLS AND STONE QUARRIES

We have for sale the following machinery in absolutely first-class condition. Location with prices will be furnished on application:

- 2 No. 6 Gates Crushers, in first-class condition, practically new, with manganese steel head and concave.
- 7 Emerick 10-foot Air Separators.
- 1 30-inch Pratt & Cady low pressure Gate Valve. (Never used.)
- 1 Stroud Pulverizer (class O Stroud air separation, practically new.)
- 2 No. 3 Semi-vulcanite Williams Pulverizers (good condition.)
- 1 Williams Roller Feed Steam Jacketed Pulverizer (practically new.)
- 3 Marion Model 60, 2½ yd. STEAM SHOVELS, late shop numbers, good condition.
- 2 Ingersol-Rand Compressors, for 950 feet per minute, 100 pound pressure
- 2 Ingersol-Rand Compressors, for 1275 feet per minute, 100 pound pressure.

We have machinery of all kinds and descriptions for Cement Mills, Lime Kilns, Stone Quarries and Gravel Pits.

Write for Information

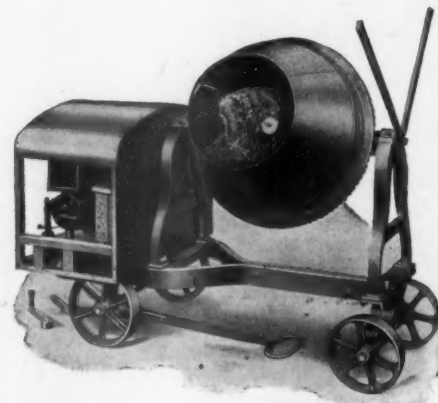
M. T. HAYES & COMPANY
MACHINERY

EXECUTIVE OFFICES, SINGER BUILDING :: 149 BROADWAY, NEW YORK

Stop!—Look!!—Listen!!!

The Big-An-Little-Mixer

A MIX A MINUTE



If so, think of every possible advantage you could ask for or desire in a Small Batch Mixer. Check them over against the "BIGANLITTLE" and you will find them all present. Try it.

First crack out of the box, you want.

A Mixer that really mixes—A Mixer where you see what's going on—A Mixer that mixes all kinds of material—A Mixer that runs easy and takes little power—A Mixer that is easily loaded and unloaded—A Mixer that is easily cleaned—

ed—A Mixer that is strong and durable—A Mixer that will save you money—A Mixer that you buy at the right price.

If you are a contractor on big and little jobs, write us for more information about this "BIGANLITTLE" Mixer, which will be a surprise for you on big and little jobs, as this mixer is both big and little—big in results and little in size.

Smaller than other Big Mixers Larger than other Small Mixers

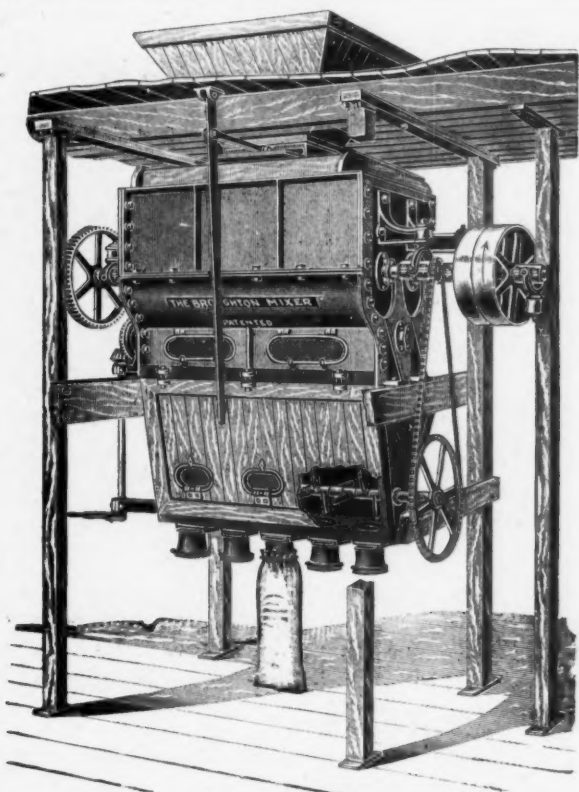
PRICE F. O. B. FACTORY, \$165.00

Write for Catalog A-1

The Jaeger Machine Co., 216 West Rich Street,
COLUMBUS, OHIO

Eastern Representative: S. M. COE, 150 W. 65th Street, New York City.
Pacific Coast Representatives: THE EDWARD R. BAC N & CO., San Francisco, Calif.

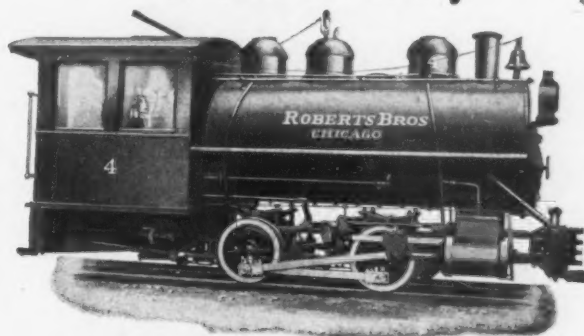
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The most thorough and efficient
Mixers of Plaster, Cement and
Dry Materials. Send for Circular.

W. D. DUNNING, Water St., Syracuse, N. Y.

Do You Have Cars to Haul?
The Davenport Locomotive
Will Save Money



Special Designs for Special Purposes
Any Size, Any Gauge, Any Weight
Write for Prices and Particulars

DAVENPORT LOCOMOTIVE WORKS

DAVENPORT, IOWA

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Seattle, 617 Western Ave.
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New York, 30 Church St.
St. Paul, 1308 Pioneer-Press Bldg.
Cincinnati, O., 703 1st Nat. Bank Bldg.

Canadian Representatives:

F. H. Hopkins & Co., Montreal, Que.,
Dominion Equipment & Supply Co., Winnipeg, Man., Edmonton, Alta.

Universal Cableway Excavators

The Machine You Want for Digging Sand, Gravel, Clay or Other Earth and Delivering
to Bin, Railway Car or Storage Piles.

A drag scraper bucket
that digs positively
and easily.

An automatic trolley
that dumps scraper
quickly and positively
at any point on track
cable.



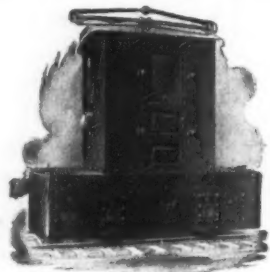
PIILING STRIPPING AT MT. PULASKI, ILL.

The most substantially
built machine on the
market. Submit your
conditions to us for
advice and estimates.
Machines are reason-
able in price and oper-
ating cost is unusually
low.

Manufactured By

J. C. BUCKBEE & COMPANY, First Nat'l Bank Bldg., Chicago

Tell 'em you saw it in ROCK PRODUCTS



No. 6550
Electric Industrial Locomotive

THE ATLAS CAR & MFG. CO. CLEVELAND, OHIO

— MANUFACTURERS OF CARS FOR —
QUARRIES, CEMENT WORKS, AND GENERAL
USES. ELECTRIC CARS AND LOCOMOTIVES,
TURNABLES, SWITCHES, FROGS.



No. 274
End Dump Quarry Car



No. 805
Dumping Stone Carrier.

SACRIFICE SALE

Lidgerwood electrically operated cableway, span 700 feet, capacity 5 tons, used one season only and in excellent order.

Lidgerwood steam operated cableway, span 700 feet, capacity 5 tons, used three years or more, in fair order.

Belt conveyor outfit with 395 feet 18 inch conveyor belt, rollers, guides, measuring boxes, gates, hopper, etc., in good order.

**East Creek Electric Light
and Power Co.**

ST. JOHNSVILLE, - NEW YORK



HERE are three elements which determine the success of any building,—its architecture, the materials used and the construction.

¶ In the last analysis the materials count. There is a connecting link between the construction and final satisfaction, and that is **Atlas Portland Cement**, because it assures success.

"The standard by which all other makes are measured"

Tell 'em you saw it in ROCK PRODUCTS